TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

AUGUST
1945

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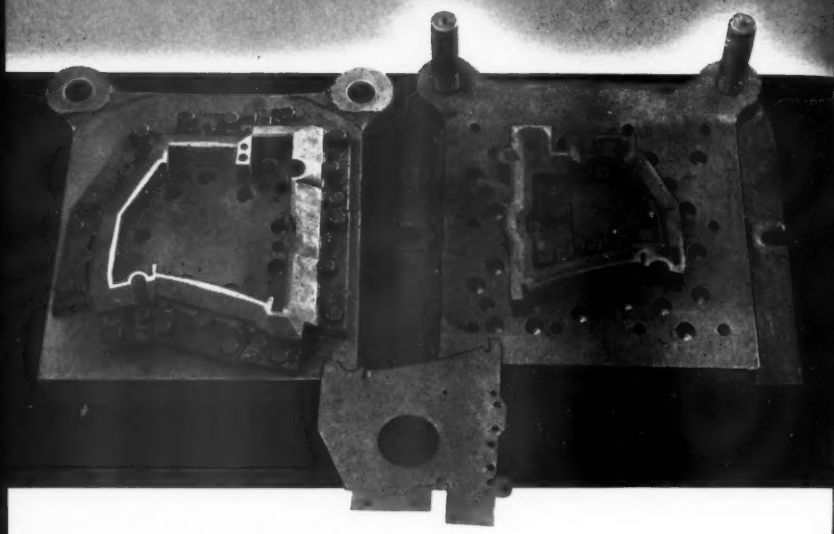

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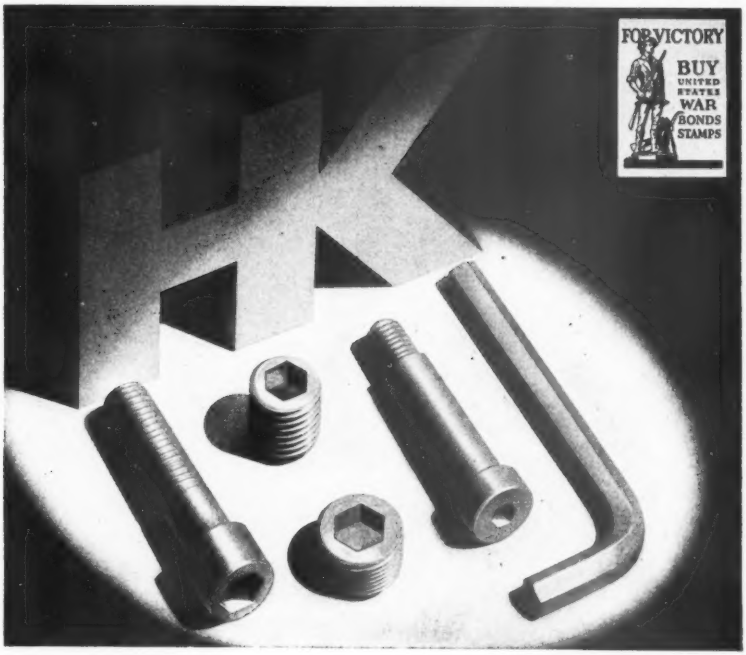
THE BETTER FASTENING METHOD



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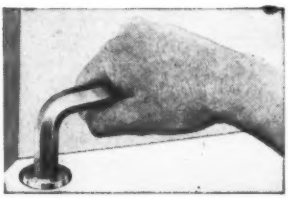

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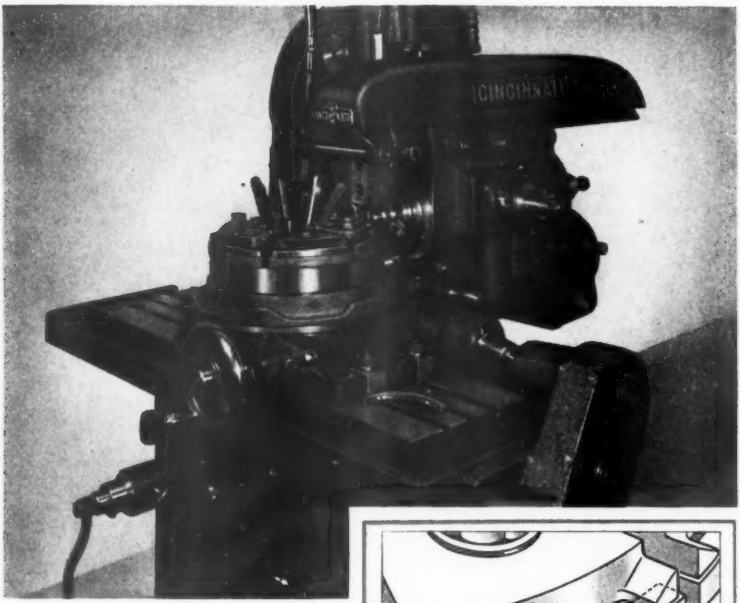
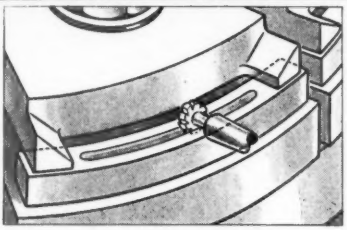


Close-up showing the attachment, fixture and work. Four lobes on the attachment cam are plainly visible. Rods protruding from the fixture are handles of cam clamps which hold the parts in position for milling. The machine is a CINCINNATI No. 2-24 Automatic Cam Controlled Rise and Fall Miller.



This simplified sketch shows how the part is milled. Hydraulic pressure maintains contact between a roller affixed to the spindle carrier and a cam on the Circular Milling Attachment, synchronizing the rise and fall of the cutter with the rotation of the attachment, thereby feeding the cutter to depth and raising it out of the way of the clamps on the fixture.

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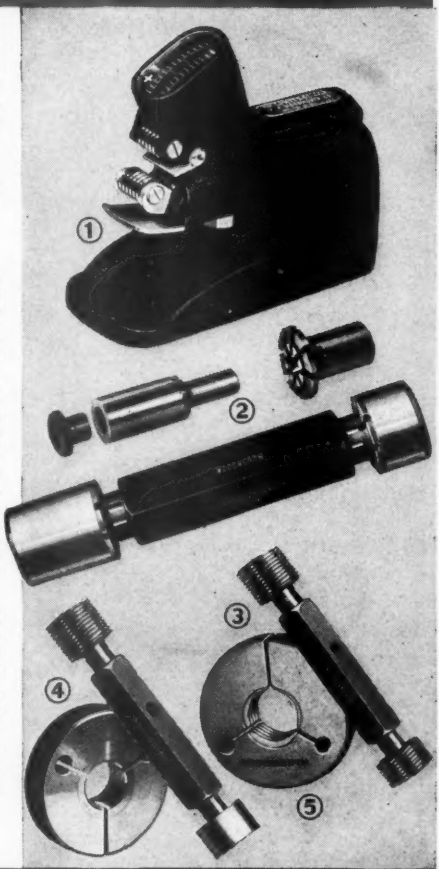

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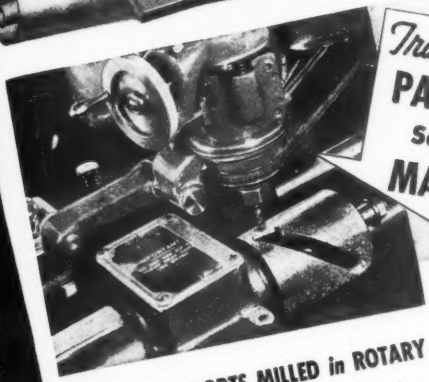

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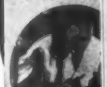

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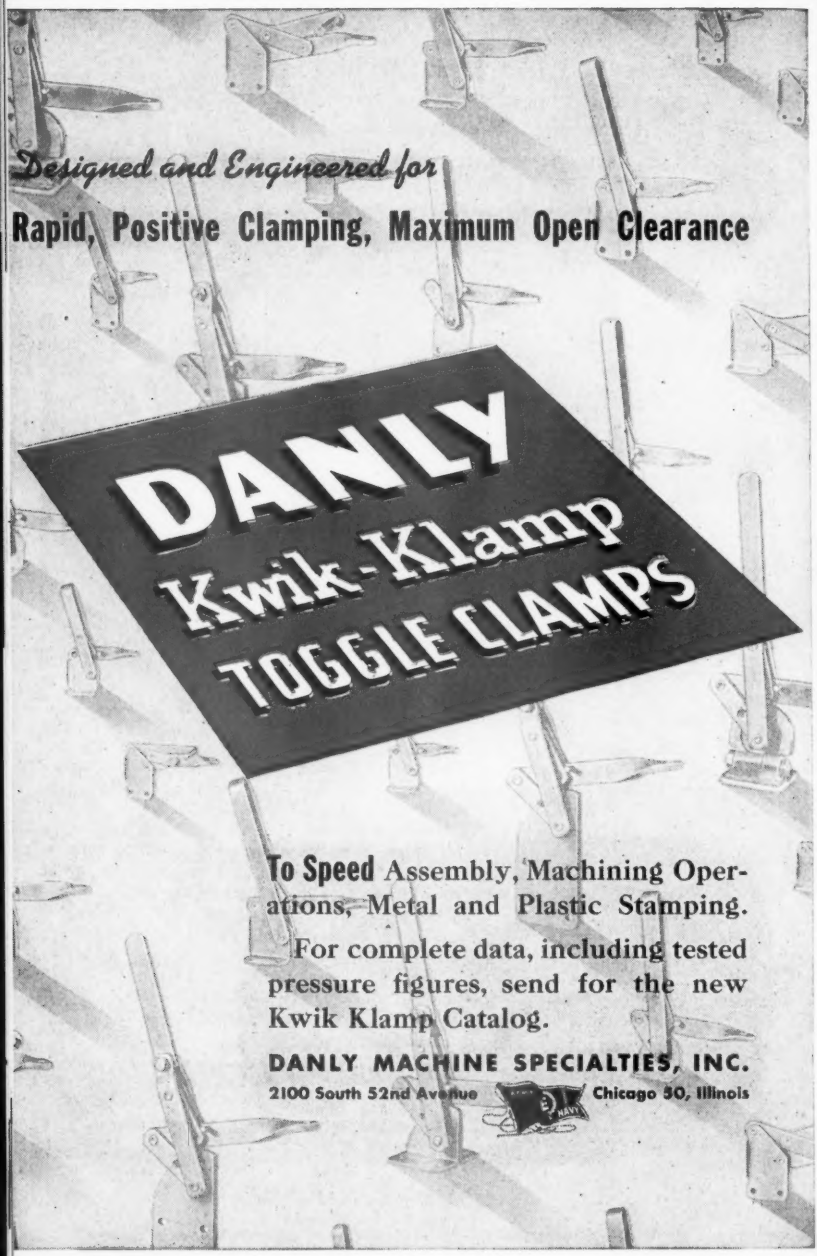
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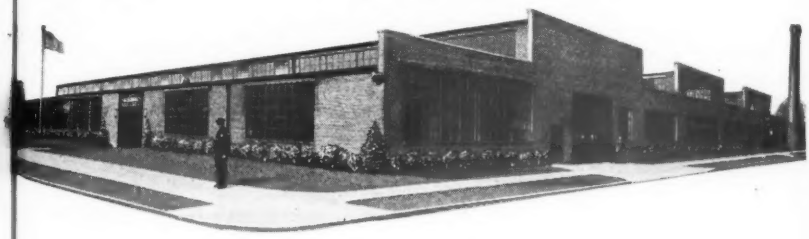

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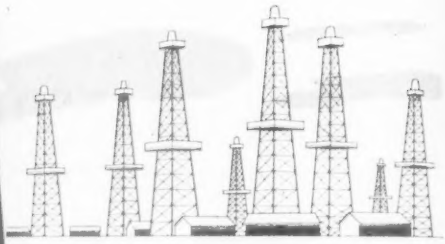

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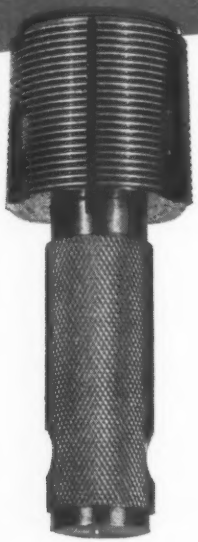

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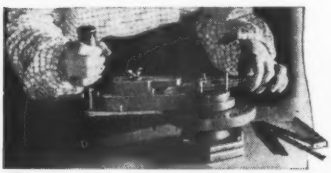
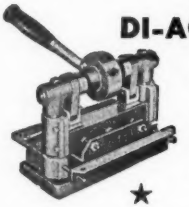
"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on Request.)

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines, — Benders, Brakes, Shears. Picture below shows the DI-ACRO Bender making an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO units maintain a high out-put on production work.





DI-ACRO Shear

Squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. 3 sizes. Shearing widths, 6", 9", 12".

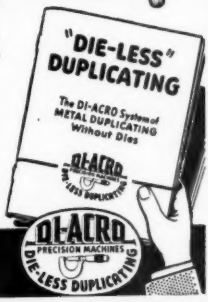
DI-ACRO Brake

Forms non-stock angles, channels or "Vees". Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".

Send for Catalog

showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING".

Pronounced "DIE-ACK-RO"


"DIE-LESS" DUPLICATING
The DI-ACRO System of METAL DUPLICATING Without Dies
DI-ACRO
DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

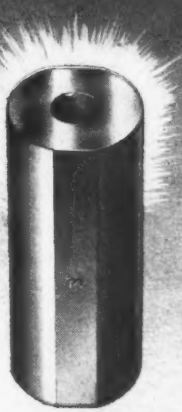
O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVE. SOUTH • MINNEAPOLIS 15, MINNESOTA

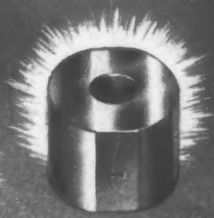
ELLSTROM

CHROMIUM PLATED

ROUND GAGE BLOCKS NOW AVAILABLE



Doubles the Gaging Surface



AVAILABLE in three standard degrees of accuracy—"working sets" with a guaranteed tolerance of plus or minus .000008 inch per inch of gage, "inspection sets" with a guaranteed tolerance of plus or minus .000004 inch per inch of gage and "laboratory sets" with a guaranteed tolerance of plus or minus .000002 inch per inch of gage.

1. When you use the new Ellstrom round gage blocks, practically *all* of the gaging surface can be utilized because there are no corners, as in the case of the rectangular or square blocks. For example, the gaging area of a round block is .9970 square inch while the gaging area of a rectangular block is .4968 square inch. Gage life is thereby increased.

2. Chromium plating increases gage life many times over ordinary steel gage blocks.

3. Use of the round shape gage virtually eliminates chances of tipping, causing possible injury to the gaging surface. "Flats" prevent rolling.

4. Gage quickly returns to room temperature after handling, because of center holes.

ROUND GAGES
PRICES PER SET

Set No. 2-85-W	$464.00
Set No. 2-85-I	695.00
Set No. 2-81-W	437.50
Set No. 2-81-I	656.25
Set No. 2-35-W	222.50
Set No. 2-35-I	318.75
Set No. 2-36-W	259.35
Set No. 2-36-I	373.75

(Prices on individual blocks on request)

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

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Att. Advertising Department
VINCO TAPER RINGS & MASTER PLUGS
Accurate to a tenth - superior finish by exclusive VINCO methods - - designed to check one of the most exacting of precision parts - the control bushing on airplane propellers - one VINCO item, but it typifies the care, skill and overall perfection that is the mark of all VINCO Precision Products - a powerful suggestion that to buy VINCO is to buy with the confidence that the Standard of VINCO Excellence will always be an unfailing standard when future gaging needs are to be met.
MILLIONTHS OF AN INCH FOR SALE BY VINCO
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Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development

Knock-Out
UNIVERSAL TOOL GRINDERS
ARE READY...

MULTIPLE SPEED
UNIVERSAL TOOL GRINDER

For postwar production and maintenance too . . .

Ready! Yes, ready to serve on the tremendous job which is still ahead. When the war began *Knock-Out* Tool Grinders were ready and served their country and Allied Nations well. Now, as reconversion becomes a reality *Knock-Out* Grinders are once again ready to take their place on the production line and on tool maintenance work.

A product is no better than the tools with which it is cut and shaped. Keep those tools sharp and keep them right! Whether you're using high speed steel or carbide tipped cutting tools, there is a K-O Grinder built to accommodate your needs. The low original cost and negligible upkeep on *Knock-Out* Grinders makes hiring others to do cutting tool maintenance highly impractical.

Knock-Out Engineers have made available more time-tested grinder fixtures than has any other manufacturer. If it can be done—it can be done more easily and economically on a K-O Grinder.

Get in touch with *Knock-Out* at Aberdeen or with your nearest K-O distributor.

SINGLE SPEED
UNIVERSAL TOOL GRINDER

UNIVERSAL
CARBIDE TOOL GRINDER

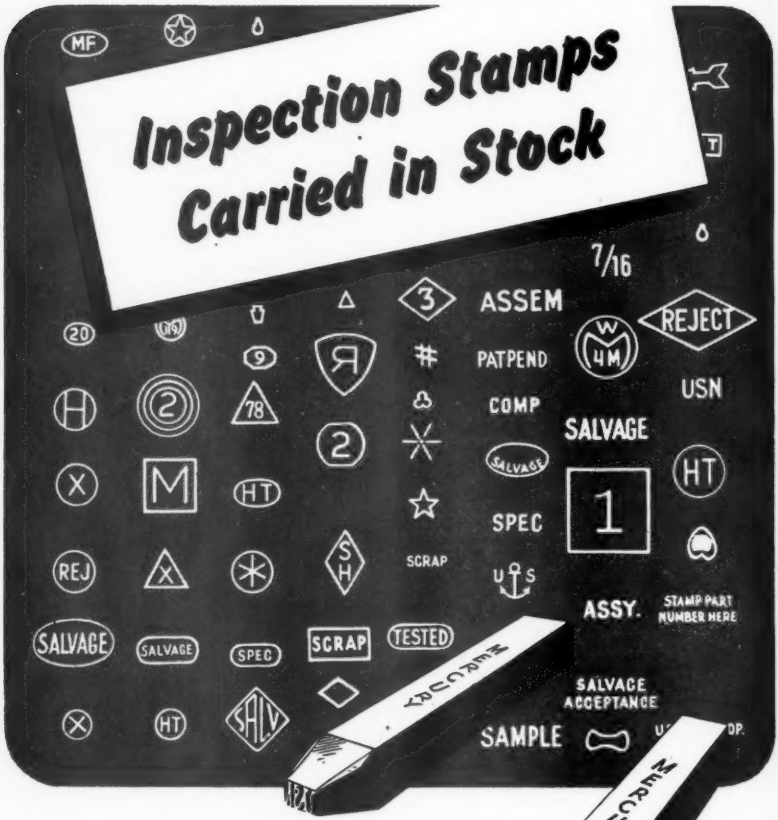
CHIP BREAKER GRINDER

See Your Nearest Distributor Or Write To

K. O. LEE COMPANY--ABERDEEN, S. D.

Manufacturers of fine tools and equipment for over thirty years

Inspection Stamps Carried in Stock



. . . or made to order!

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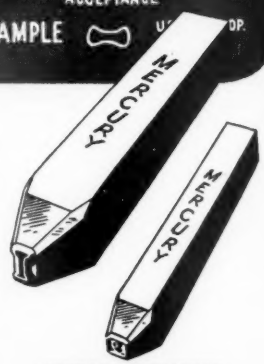
Send us a drawing or sample of the impression you require, and briefly outline your marking problem. The stamp to fit your needs is probably ready for delivery—or can be quickly made to your specifications. *Complete manufacturing facilities are available to solve your marking problem.*

WRITE DEPT. D FOR FULL DETAILS—TODAY!



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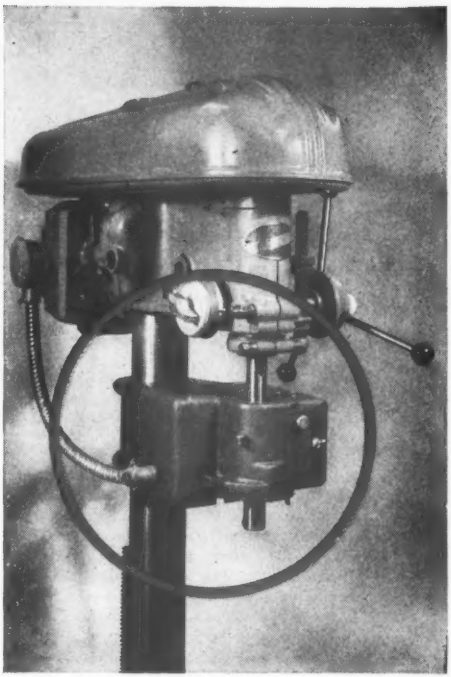
precision TAPPING

on your own drill press

with unskilled labor

Class III threads — consistently! The Rotorex attaches to your drill press in hour. Changeovers, tapping or drilling, minutes. Controlled lead assures precision. Includes fast control for tapping or drilling.

ROTOREX requires little more vertical space than a tapping chuck — yet gives accurate tapping in a wide range of sizes. It makes drilling and tapping possible on a single press unit, or, installed on one or more units of gang drills, allows continuous line production from drilling through tapping. Economical, easy to operate and rugged, it will help solve your tapping problem. Send for free booklet and complete details.



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1. Positive, automatic control of lead.
2. Hardened, precision ground lead screws.
3. Instantaneous emergency reverse.
4. Complete automatic cycle.
5. Accurate control of depth — accuracy to .010.
6. Foot control frees operator's hands for loading.
7. Capacity 0-80 to ⅞".
8. Price complete, $175.00, F. O. B. factory (May be purchased on your MRO rating).

$175.00

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SAND-O-FLEX

DEBURRS, SANDS, FINISHES ALL MATERIALS— QUICKLY, ECONOMICALLY, REGARDLESS OF CONTOUR

The Sand-O-Flex is a compact (outside diameter 8"), lightweight (2¼ lbs.), quickly-loaded (1 minute maximum) sanding wheel that deburrs, sands, finishes any material—wood, metal, plastic, rubber, special products—equally well. Particularly effective on irregular surfaces and hard-to-get-at places. Fits any ½" or ⅜" stationary or flexible motor shaft and operates effectively on portable electric tools. A wide range of abrasives of various grits and grades are supplied for use with the Sand-O-Flex. For additional information write or wire.

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New!

WRITE FOR YOUR COPY TODAY

The complete line of Ford Carbide Cutters is described and illustrated in this new 4-page bulletin. All standard styles and sizes are listed, as well as a selective few Carbide Specials which have been made to customer specifications.

Carbides enjoy the distinct advantages of faster cutting speeds, greatly increased tool life, with proportionately fewer regrinds, lower tool inventory, maximum production economy. In actual test they have been shown to outlast ordinary high speed steel by a ratio of fifty to one.

If you are interested in attaining these advantages, write for your copy today.

M. A. FORD MFG. CO., INC.
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HAND CUT FILES • GROUND FROM SOLID CUTTERS • CARBIDE CUTTERS

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SATISFYING those who are satisfied only by excellence . . . producing custom-designed tools for those Industrial Leaders from whom excellence is, in turn, demanded . . . Star Machine & Tool Company serves now as it has for three generations in the toolmaking field.

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IT'S BEST TO BABY 'EM!
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Carbide tool cutting edges should be protected so that they do not come in contact with other tools or metal parts except when cutting. It is best to provide wooden, partitioned boxes for storage. Use plastic dip or tape on the tips.
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Please send us without obligation on our part_____ sets of Firthite Field Service Posters which we wish to display in our plant shops.

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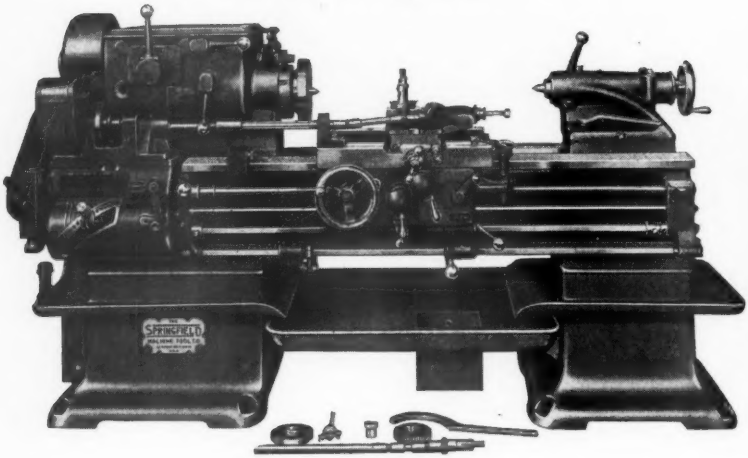
COMPANY_____
ADDRESS_____

SPRINGFIELD PRECISION LATHE

Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

SEND TODAY FOR BULLETIN No. 163

Tells the why and how of Springfield's accurate production.

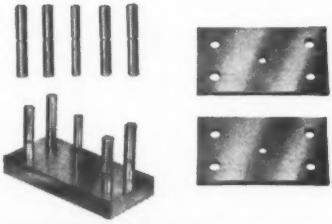
THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

4 Hole Grinding Problems { CAN YOU ESTIMATE THE TIME?

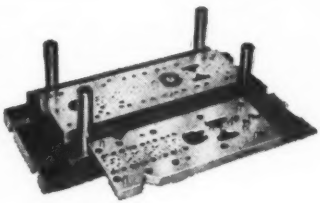
TWO-STATION DIE BLOCK

All holes ground to exact size and location. Blank hole and center piercing hole ground with one half degree included taper. Little clearance permissible between punch and die. 2¾ *hrs. on the Moore Jig Grinder.*



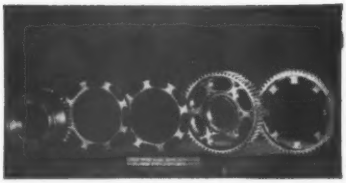
TEN HOLES IN MASTER PLATES

Hardening distortion corrected in two plates. Ground to size and location *independently* and to plug gage fit in any of the four possible positions. 3½ *hrs. on the Moore Jig Grinder.*



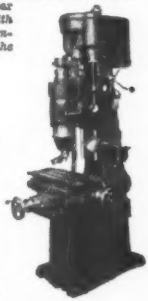
TEN-STATION DIE

100 holes located and ground to .0002" tolerance in hardened die and stripper inserts. Die parts, four stripper inserts, two gutting punches and shaving punch ground in 50 *hrs. on the Moore Jig Grinder.*



FIVE ACCESSORY GEARS IN MASS-PRODUCTION

Gear A: Eight holes on circle ground to size and location within ±.0003"...*Gears B, C, D, E:* Radii at ends of elongated pockets ground to size and location within ±.0003"...*Gears B, C:* Radii ground to shoulder near bottom of pocket within ±.0005". *With special indexing fixture, 4 aircraft engine gears per hour finished on the Moore Jig Grinder*



"Correcting Hole Location Within Less Than .0001" is the title of our new 28-page catalog which describes the operation and applications of the Moore Jig Grinder to dies, drill jigs, gage parts, master plates and production parts. Write for your copy today.
MOORE SPECIAL TOOL CO., INC. • UNION AVENUE, BRIDGEPORT 7, CONN.

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Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND

BIG NEWS FOR CARBIDE-TIPPED TOOL GRINDERS

Precision-grinding carbide-tipped tools and dies? Try the Por-os-way wheel with green silicon carbide — the remarkable grit now back from war. Por-os-way grinds faster, cheaper, won't burn or discolor. Put it to work!

2 TO 5 TIMES LOWER GRINDING COSTS

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PROSPERITY after the war means high production, low wages, helpful laws, sensible taxes . . . so all Americans can earn more, buy more, have more.
ORDINARY WHEEL

MACHINISTS are loud in their praise of Por-os-way. And no wonder, for this unusual wheel has made grinding history! Por-os-way's unique *open structure* cuts cleaner, cooler and *deeper*. It rough grinds and precision finishes hardest metals at a speed undreamed of only three years ago.

Give *your* men the wheel they'll really enjoy working with and you'll give the boss rock-bottom costs to beat postwar competition. Set your grinding sights high and remember that Por-os-way has seldom been pushed to its limit. For *proof* call in a Por-os-way engineer and let him work out Por-os-way on your *toughest* job. A. P. de Sanno & Son, Inc., 464 Wheatland Street, Phoenixville, Pa., Since 1893.

← LOOK AT THE DIFFERENCE!

Your eye tells you at a glance why Por-os-way is *different*. See the *extra porosity* that gives you over 8 distinct operating advantages!

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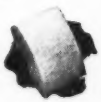
POR·OS·WAY*

The Precision Grinding Wheel

THE WHEEL THAT COSTS THE MOST AT FIRST . . COSTS THE LEAST AT LAST

POR-OS-WAY "NOISELESS" SURFACE GRINDING ASTOUNDS MACHINISTS

Do more surface and face grinding, faster, quieter with Por-os-way segments. Notice how moan, groan and grunt disappear ... because Por-os-way cuts the metal, doesn't "scrape" the surface. Cuts deeper, lasts longer —with less dressing, too. Try it!



WHEN COLLET WORK IS INDICATED - SPECIFY

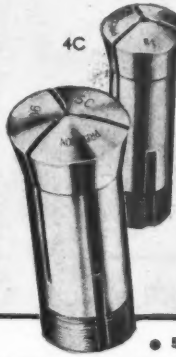
Precision Collets

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

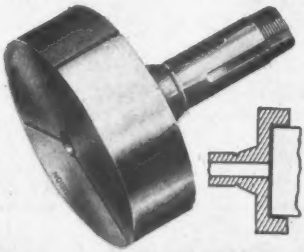
IMMEDIATE DELIVERY FROM STOCK

The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

- MODEL 3AT: For 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft.
- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

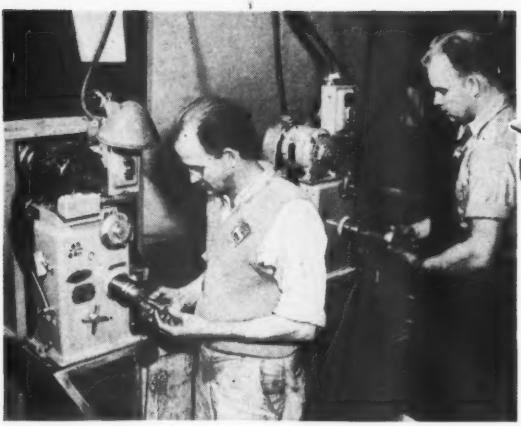


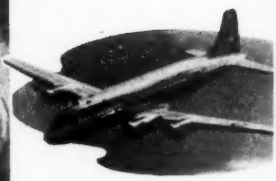
KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.



● **5C KLUTCH-KOLLET NOW READY. List Unbored $10.50.**

GENERAL DIE and STAMPING CO. **262 MOTT STREET, NEW YORK 12, N. Y.**





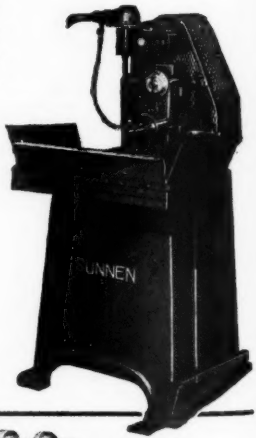
Sunnen Precision Honing Machine

1. Hones and finishes internal cylindrical surfaces from .185" to 2.625".
2. Accuracy guaranteed within .0001".
3. Produces super-smooth finish.
4. Accurately duplicates sizes.
5. Does not require skilled labor.
6. Can be "set up" for any size in 1 minute.
7. No jigs or fixtures needed.

At Douglas Aircraft... Honing Time Reduced From 3 Hours to 30 Minutes With the SUNNEN PRECISION HONING MACHINE

On the famous Douglas C-54 combat transport plane, there is a tiny sleeve that goes into the hydraulic regulator pressure assembly. This sleeve, with an inside diameter of .187" is polished to a very high finish. Accuracy is held well within a .0001" tolerance. Former time for lapping was approximately 3 hours—never less than 1½ hours. Now the job is done in 30 minutes—a production increase of from 300 to 600%!

Do you have a lapping job that you'd like to speed up or an internal grinding job on which you want a better finish? — If you do, call in a Sunnen engineer, or write for complete details.



SUNNEN PRODUCTS COMPANY

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Canadian Factory
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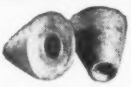
SUNNEN

Bearing. A very small part. 2 micro-inch finish necessary.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro-inch finish.

QUIT Making Manual CLAMPING ADJUSTMENTS!

Let the Pressure-Matic Assembly provide automatic compensation for thickness variations in parts being clamped

There may be variations up to ¼ inch in the thickness of work being held—castings, forgings, wood and plastic parts. With a Pressure-Matic Assembly welded to the working bar of your De-Sta-Co Clamp, compensation for each variation becomes automatic. A heavy compression die spring allows the spindle to adjust itself to the thickness of material, always maintaining positive holding pressure. Available in two types, for installation on De-Sta-Co medium and heavy duty Clamps.

SEND FOR the new De-Sta-Co Catalog No. 45. Fully describes the Pressure-Matic Assembly, also complete line of time-saving Clamps.

DETROIT STAMPING CO.

Established Over 30 Years

344 Midland Ave • Detroit 3, Mich.

"paid for itself the first day"

says

MIDWEST AIRCRAFT MOTOR MANUFACTURER
(name on request)

Thomas
PATENT APPLIED FOR
METAL DISINTEGRATOR

for PRECISION ARC-BORING

SINCE the first day, says this manufacturer, thousands of dollars of valuable castings and thousands of man hours put into those castings have been saved by the THOMAS process.

THOMAS will pay for itself in the production line in your plant, too, performing all these operations—

Remove broken or imbedded Taps, high-speed Drills, Reamers and Studs without damage to valuable work-pieces. Drill holes and cut slots, keyways and channels in the hardest metal made by man . . . after heat-treat. Scarify and drill holes in hardened dies. Pierce armor plate. And hundreds of other labor-saving, money-saving operations.

Accurate and Dependable—Easy to operate—No adjustments — Low operating and maintenance costs—4 THOMAS Models to fit any price or operating condition (Super Model shown). Let us prove, in your own plant, that only THOMAS solves your (W)Hole problem. No obligation.

SEND IN COUPON FOR LITERATURE OR DEMONSTRATION!

Clinton
MACHINE COMPANY
CLINTON, MICHIGAN

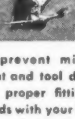
CLINTON MACHINE COMPANY
CLINTON, MICHIGAN
Gentlemen:
Please send literature on Thomas Tap Extractor and Metal Distintegrator. ☐ We would like a demonstration in our own plant. ☐
NAME.....
ADDRESS.....
CITY.....STATE.....

This Machine
LOOKS TO THE FUTURE

Illustration shows standard *American* V-1½-4 ton Vertical Hydraulic Press tooled for broaching four wrench slots simultaneously in a time fuse. The slide on which the fixture is mounted is interlocked with the machine controls. Rate of production is 200 parts per hour with fine finish. This is just one example of the many types of jobs performed by this versatile machine.

THIS standard *American* V-1½-4 ton Vertical Hydraulic Press greatly simplifies reconversion and makes possible worthwhile savings in equipment and re-tooling costs. It is capable of performing a large variety of work and is easily and economically changed over from one job to the next.

American engineers have developed several such versatile standard machines. One or more will undoubtedly fit into your present or future operations. When planning new production, be sure you get *American's* recommendation. There is no obligation. It is part of *American's* complete broaching service—machines, tools, and engineering. Write today for details.



To prevent misalignment and tool damage, use proper fitting pull heads with your broaching tools.

MEMBER BROACHING TOOL INSTITUTE

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF S

Simplify **DRILLING JOB SET-UPS WITH**

SIEWEK

STANDARD RAPID CLAMPING DRILL JIGS

SPRING OR RACK-AND-PINION TYPES—SQUARE OR OVAL TOP PLATES—11 STANDARD SIZES

Manufacturers of
SIEWEK
Fixture Clamps and Fittings

SIEWEK TOOLS ARE SPEEDING THE WAR EFFORT

One Siewek Jig—with simple adapters that you make in your own shop—can replace many special jigs. Save designing and tool room time . . . Eliminate excess "idle time" for drill presses . . . Assure faster, easier set-ups and re-tooling operations.

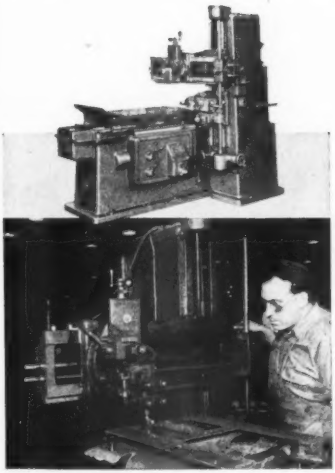
Siewek Jigs are available in spring type for light work and rack-and-pinion type for heavier uses. Right or left hand operation. They are built to precision standards—sturdy and simple in construction.

Write today for Siewek Jig Catalog 6-J.

SIEWEK TOOL DIVISION • DOMESTIC INDUSTRIES, INC.,

231 SOUTH LA SALLE STREET • CHICAGO 4, ILLINOIS • DISTRIBUTORS IN PRINCIPAL CITIES

Hy-Draulic Machine Tools at LOCKHEED



36-inch Openside Hy-Draulic Shaper working on tail cone assembly jig.

Hy-Draulic Shaper-Planer at work on a punch.

Illustrated are two of the Hy-Draulic Machine Tools in operation in plants of the Lockheed Aircraft Corporation. Note the job on the 36″ Openside Hy-Draulic Shaper. Large area, supported by jack screws; light chip. Could be heavy chip so far as the Hy-Draulic Shaper is concerned. Machine will pull beyond maximum capacity of cutting tools for which clapper box is designed. Accuracy is maintained by solid support of box-section table by extra long bed. Speed is promoted by hydraulic table drive, hydraulic feeds, centralized controls and other features.

The Shaper-Planer is machining a work-piece that is much too large for any shaper, yet the job is too small and too light for most economical production on a planer. Hydraulic table-drive and hydraulic feeds in the Shaper-Planer are infinitely adjustable in specified ranges. They give you the *exact* combination of speed and feed required to produce each piece of work most efficiently. High-return ratio promotes maximum cutting strokes a minute. Reversals are cushioned. No matter how high the speed in either direction, it is impossible for the table to shoot off the bed of a Shaper-Planer.

Details of production and operations performed by Hy-Draulic Machine Tools at Lockheed are military secrets. Details of Hy-Draulic Machine Tools and their notable advantages for war and post-war work will be supplied promptly on request. Write, today for Bulletin 2509.

4412

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

SPEED RECONVERSION

• WITH COMPOSITE DIE FABRICATION BY WELDING

(Above) Composite-Fabricated Die. The Base is Mild Steel, the Cutting Edges, "Hard-As-Welded" Deposits of Eureka Oil-Hardening Tool Steel Electrodes.

Eureka Tool and Die Welding Electrodes, for composite die fabrication, facilitate planning and effect speedy results in reconversion. Plain carbon or low alloy NE steels are used as a base and weld deposits of the various Eureka Tool and Die Welding Electrodes constitute the cutting edges or working areas. Units so constructed efficiently replace those constructed entirely of tool steel.

ELIMINATION OF HEAT TREATMENT

Deposits of Eureka Electrodes, which are "hard-as-welded" eliminate the need of complete heat-treatment after welding.

COSTLY MAINTENANCE AVOIDED

The ability to produce a composite tool or die results in a working surface of any desired characteristic with a resilient core.

CONVERTING INTO COMPOSITE UNITS

Convert existing tool steel die sections into composite units to meet unusual conditions.

MACHINING IS FINAL OPERATION

In composite fabrication by welding, finish machining, drilling, etc., can be done as final operations.

INSERTS ELIMINATED

Composite fabrication by welding eliminates the use of inserts, which are often too costly, unsatisfactory or impractical.

MULTIPLE APPLICATIONS

In composite fabrication by welding, it is practical to weld two, three or four types of unlike materials on one die unit to perform individual functions.

EUREKA TOOL AND DIE WELDING ELECTRODES

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

AMMCO 7" SHAPER

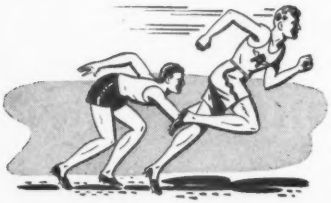
A precision machine for precision work . . .

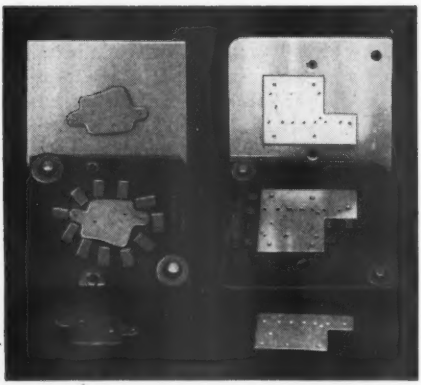
Phenomenal performance of this precision shaper in war production work is an indication of its great value in the postwar period when your competitive conditions put added importance on accuracy and low-cost production . . . The precise accuracy of work turned out on an Ammco 7" Shaper assures precision production unsurpassed by larger machines selling for hundreds of dollars more than the Ammco . . . In addition to low initial cost, you also effect big savings in time and expense on set-up operations . . . You save on electrical power consumption . . . You save on floor space—all without sacrificing quality or accuracy . . . Available for bench installation, or as a portable unit.

Write today for specifications and prices

AMMCO 2100 COMMONWEALTH AVENUE NORTH CHICAGO, ILLINOIS

YOU GET OFF TO A *Head Start* WITH ALGOMA TEMPLATE DIES!

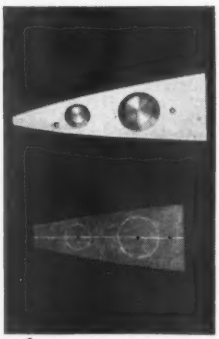




Almost ready while you wait . . . Algoma's dies, sawed from special alloy steel, sheered and filed to size, hardened and welded to inexpensive backplates . . . and there you are, dies in ¼ the time at ⅓ the cost . . . you're in production . . . "superfast." Pierce punches are individually replaceable, are of hardened and drawn tool steel and pressed into the blank die for piercing the holes in the part, adding life to Algoma dies. No matter what your problem, talk it over with us. We're sure there's an Algoma die to do your job.

ALGOMA HYDRO-FORM BLOCKS FOR FAST DELIVERY

Hydro-Form Blocks are made from hot rolled boiler plate, machined and polished to prevent scratching of parts. Mounted in the press with rubber blocks, they are furnished complete with pilot pins for location of parts. They are made to your specifications.



GET QUICK ACTION . . . TELL US THREE THINGS . . .

The metal, the gauge, the size of the run. Send a template of the part. That's all . . . you'll get a figure fast. An opportunity to prove our assertions about Algoma Template Dies is all we ask.

FOR A HEAD START, BE WISE
SPECIFY ALGOMA TEMPLATE DIES

Algoma · PRODUCTS ·

3080 EAST OUTER DRIVE • DETROIT 12, MICHIGAN

The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

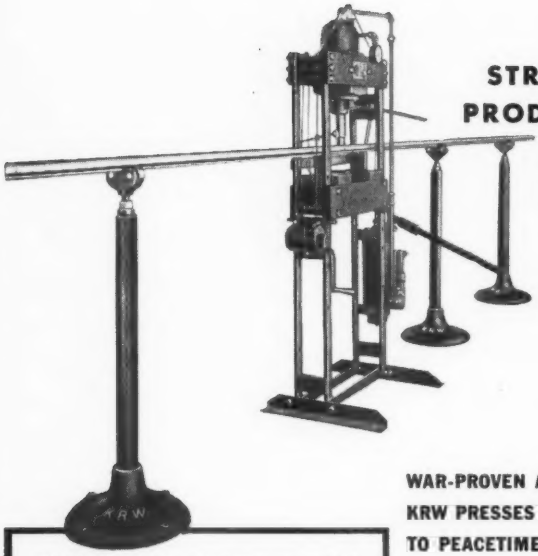
FRICTION SAWING

with Tannewitz

HIGH SPEED BAND SAWS

WRITE FOR YOUR FREE COPY

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN



STRAIGHTEN OUT PRODUCTION KINKS

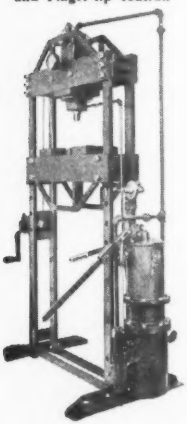
Cut Costs WITH KRW HYDRAULIC PRESSES

This KRW Hydraulic Arbor Press was specially adapted for straightening propeller shafts of great length. On this particular unit a Speedi-booster was not deemed necessary to the operation. Perhaps a variant of this unit will fit into your production planning.

WAR-PROVEN ADVANTAGES OF LOW-COST KRW PRESSES ARE NOW BEING ADAPTED TO PEACETIME PRODUCTION SCHEDULES

Literally hundreds of adaptations of the standard KRW Hydraulic Arbor Press... in a great many industries... have definitely proven the many savings that accrue from the use of these highly versatile presses. In a great many cases, special KRW Presses have replaced heavier, outmoded equipment at a fraction of the cost.

75-ton KRW Press equipped with patented Speedi-Booster and Finger-tip control.



Standard KRW Hydraulic Presses are made in 25, 50, 60 and 75-ton capacities. For special applications, these presses can be engineered to solve a specific problem... either hand operated, air-oil, electric-oil operation or in any combination. This equipment is so flexible that we have been able to design, build and ship special presses in a matter of weeks. Bring your special problems to us. We have the experience and facilities to give you *fast action.* Write for our Hydraulic Press Bulletin. K. R. Wilson, Dept. 18, 215 Main St., Buffalo 3, N. Y.

K. R. WILSON
BUFFALO 3, NEW YORK

Tops in Taps...
mirror finish
It's breaking all records in "production-per-tap"! When scores of customers specify "new mirror-finish," that's proof of superior performance!
SOSSNER N.Y.
TAPS · GAGES · STEEL STAMPS AND DIES
SOSSNER
161 Grand Street, N. Y. 13, N. Y.
27 Broadway, Lynbrook, N. Y.

● In addition to making a complete line of standard die sets, we are especially well equipped to produce special die sets to your specifications. Send us your prints for prompt action—or call the "Detroit" man in your area.

DETROIT DIE SET CORPORATION

2895 W. Grand Blvd., Detroit 2, Mich.

CALL "DETROIT"

DETROIT	TR 2-5150
INDIANAPOLIS	LI 3884
MINNEAPOLIS	AT 5264
DAYTON	HE 3042
TOLEDO	GA 5706
SEATTLE	SE 2090
PORTLAND, Ore.	AT 1466
SAN FRANCISCO	MA 8532
BUFFALO	PA 9206
PHILADELPHIA	VIC 4084
ROCK ISLAND, ILL.	R. I. 743

DETROIT DIE SETS ★

USE ADJUSTABLE PERFORATING DIES FOR INCREASED PRODUCTION

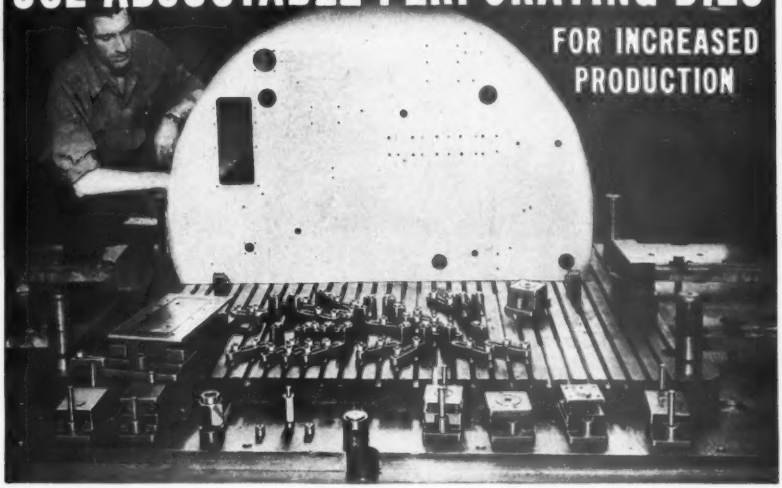
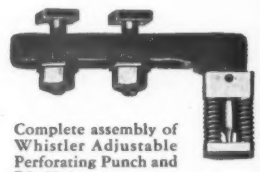


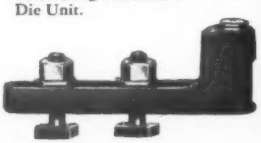
PHOTO COURTESY LOCKHEED AIRCRAFT CORPORATION

Here is Two-Fold Manufacturing Economy

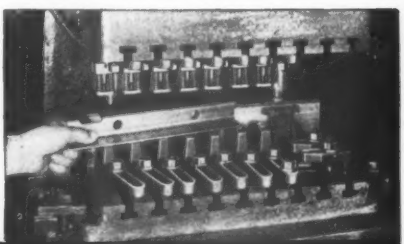
Whistler precision perforating dies get you into production quicker—make your own set-up in a matter of minutes as against weeks. Rearrange the same units—add or delete sizes or shapes—and get going on the next job. Original die cost is amortized over any number of jobs. Effect pre-production and production time savings that can only be measured by the size and importance of each job.



Complete assembly of Whistler Adjustable Perforating Punch and Die Unit.



Whistler Adjustable Perforating Dies are shipped from stock or within a few days, in sizes from 1/32" to 1 1/2"—round, square, oval and rectangle—for perforating mild metals to 1/4" thickness. Notching dies and special shapes made to order and can be used in combination with stock units. Whistler Adjustable Dies work on practically any type press. Close centers permit more perforations per press operation. Absolute precision on short or long runs. All parts are interchangeable. Write us today and ask for the Whistler Catalog.



S. B. WHISTLER & SONS, Inc.
752-756 Military Road, Buffalo 17, N. Y.

WHISTLER MULTI-USE ADJUSTABLE PERFORATING DIES

Get Carboloy Quality and Savings on Your

PRECISION FINISHING

. . . at Tool Investment Costs as low as 45c each

For long tool life, low tool cost and low machining cost per piece, combined with outstanding quality of work produced, use Carboloy Round Shank Tools!

Available at tool investment costs as low as 45c, Carboloy Round Shank Tools are now widely used by industry on work requiring tolerances as close as .0001" and on parts requiring mirror-like finish.

Carboloy Round Shank Tools are stocked cylindrically ground, with either back rake or flat top, in sizes $\frac{5}{16}$" through $\frac{1}{2}$" . . . or as solid cylindrical blanks $\frac{3}{32}$" through $\frac{1}{4}$" diameter. You quickly grind to suit. Write for Catalog GT-175R.

CARBOLOY COMPANY, INC.

11109 EAST EIGHT MILE ROAD, DETROIT 32, MICHIGAN

CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MILWAUKEE
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Also Sold by Leading Mill Supply Distributors

Available TIPPED in sizes 5/16" to 1/2"

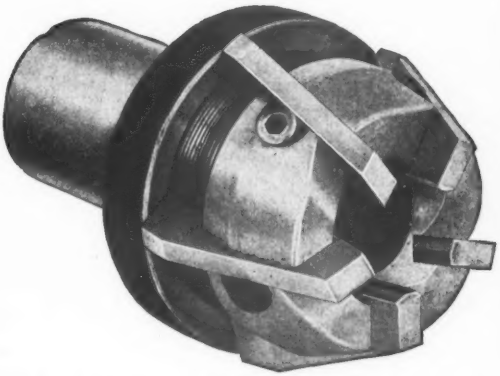
or SOLID in sizes 3/32" to 1/4"

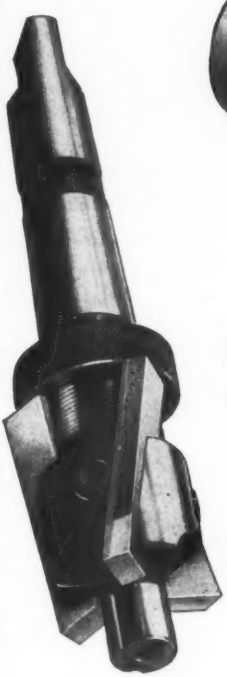
YOU QUICKLY GRIND TO SUIT

Write for Catalog GT-175R

CARBOLOY "ROUND SHANK" BORING TOOLS

GENESEE ADJUSTABLE HOLLOW MILLS





(Standard Style H)
Facing & Counterboring
Tool

Cut Cost—Increase Production

with GENESEE inserted blade—
ADJUSTABLE HOLLOW MILLS
FACING & COUNTERBORING TOOLS
SPECIAL PRODUCTION TOOLS

Backed by 35 years experience our Engineering Department is always ready to serve you in your Production Tool problems.

Write for complete Catalog No. 44-T

GENESEE
MANUFACTURING CO., Inc.
ROCHESTER 4, N. Y.

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

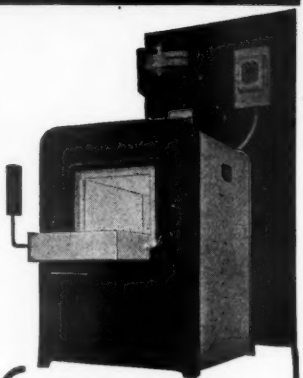
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

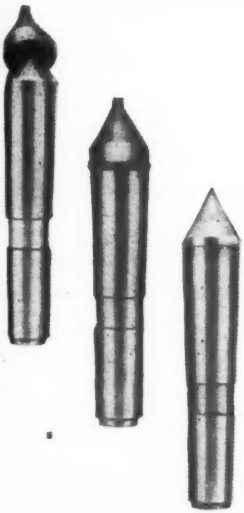
FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
32 South Shelby Street Indianapolis 7, Indiana
Export Department, 1111 S. Ferry Building, New York 4, New York

YOUR WORN TOOL STEEL CENTERS *Can be Salvaged by using*

COLMONOY

TIPPING SERVICE



● New tip castings of Colmonoy No. 6 can now be applied to your centers by using Silver Solder or a low temperature brazing alloy. Will outlast and outwear new, untipped centers.

We will apply for you, or furnish tips only. Moderate prices. Write for Bulletin CT-1 for complete information.

OFFICES

Detroit, New York, Buffalo, Chicago, Tulsa, Los Angeles, San Francisco and in Canada.

WRITE FOR LITERATURE

In addition to Bulletin CT-1, mentioned above, we shall be glad to send you our General Catalog No. 75, covering the complete line of Colmonoy Hard Facing Alloys, and illustrating typical applications.

WALL-COLMONOY CORP.

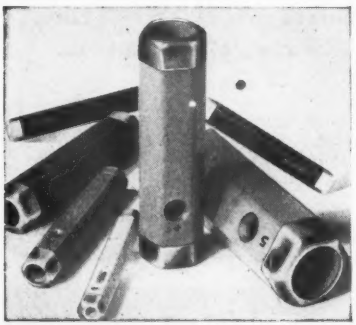
720 Fisher Bldg., Detroit 2, Michigan

FEDERAL

Taperlock Plastic

GAGE HANDLES

Made of durable plastic material, one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue . . . an advantage appreciated by women inspectors.



Federal Taperlock Plastic Gage Handles have proved very satisfactory for glass gages. Being so much lighter than metal handles, the danger of chipping and breaking is greatly reduced.

Plastic Handles insulate, protecting gages from bodily heat which might affect accuracy.

Easily marked for identification with the same tools used for marking metal handles. Available in SEVEN sizes—00 for small gages, 0, 1, 2, 3, 4 and 5. In FOUR colors — Red, Green, Yellow and Black.

IMMEDIATE DELIVERY
On Rated Orders

FEDERAL TOOL CORPORATION

400 NORTH LEAVITT STREET **CHICAGO 12, ILLINOIS**

SOUTH BEND VERSATILITY REDUCES PRODUCTION COSTS

Write for
CATALOG 100-D

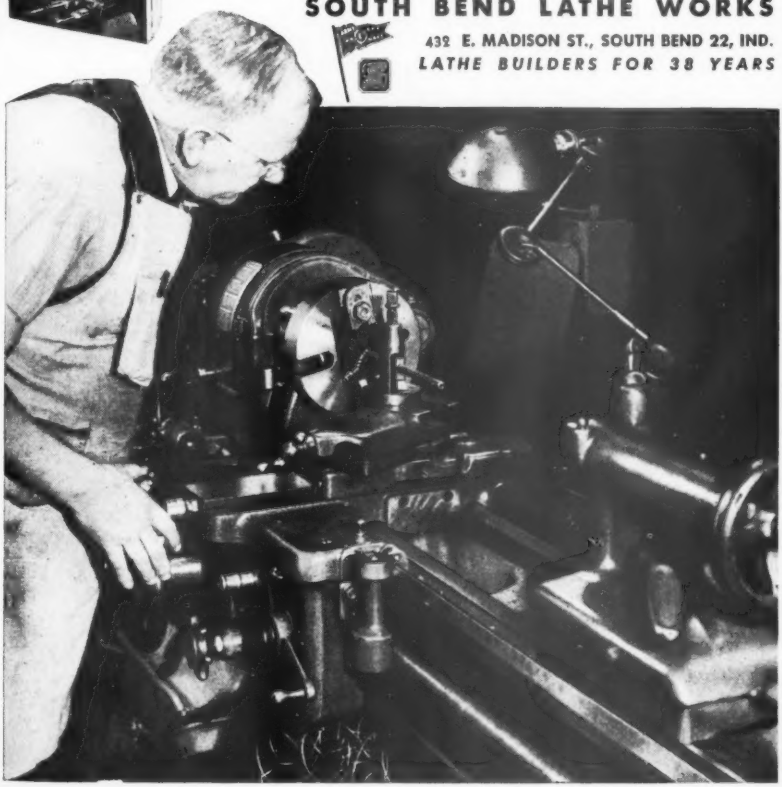
Illustrates in full-color and describes South Bend Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½" and 16" swings. Also, Precision Turret Lathes with ½" and 1" collet capacities.

In reducing costs, on either production or toolroom work, the proven versatility of South Bend Lathes can effect valuable savings. It permits getting new products into production quickly—change over from one job to another with little inconvenience or loss of time. Their adaptability, together with a complete line of practical attachments and accessories, permits handling a wide variety of operations. Often, the use of special machines and fixtures can be avoided, thus preventing capital losses resulting from the inevitable scrapping of costly custom-built equipment with each change in product design.

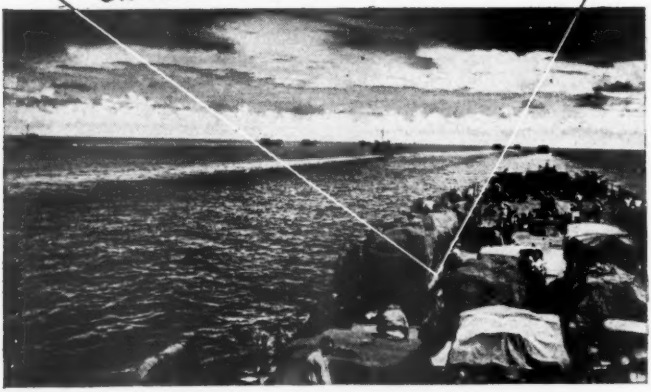
SOUTH BEND LATHE WORKS

432 E. MADISON ST., SOUTH BEND 22, IND.

LATHE BUILDERS FOR 38 YEARS



On their Way again to Win again!



Are You?

Today veterans of our European victories are sailing to final triumph in the Pacific! Meanwhile American industry is following a full-speed program to hasten peace through the Payroll Savings Plan!

From coast to coast, veteran Bond salesmen are again mustered into service for plant-wide selective resolicitation campaigns, designed to:

★ Hold all new 7th War Loan subscribers on Payroll Savings Plan books, maintaining or increasing present allotments—

★ and convince all regular subscribers, who recently stepped up their Bond buying, of the advantages of continuing on this patriotic, save-more basis.

Back up our fighting men who have won one war—and are out to win another! Use selective resolicitation to step up your Payroll Savings Plan—tighten the rein on inflationary tendencies—build peacetime prosperity.

The Treasury Department acknowledges with appreciation the publication of this message by

Tool & Die Journal

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council

Precision Grinding

IN THE TOOL ROOM
IN PRODUCTION

Designed for the Tool Room and Die Shop where precision workmanship is all important... Built with Boyar-Schultz quality, resulting in sturdiness that HOLDS accuracy, not only in tool and die work, but in production wherever accuracy is necessary.

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No. 618 SURFACE GRINDER

A sturdy, easy operating Surface Grinder, designed for the Tool Room and built to give positive precision performance over long periods of time.

No. 1 PROFILE GRINDER

A bench size Profile Grinder. A time saver in grinding dies, punches, cams and templates. Operates at 20,000 R.P.M. A rapid stock remover.

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A larger, heavier Profile Grinder with two independently powered spindles, operating at 10,000 R.P.M. with vertical oscillations.

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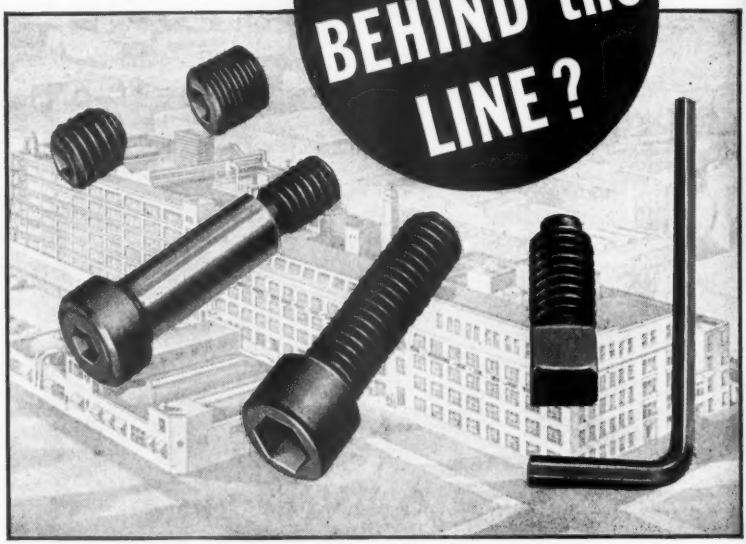

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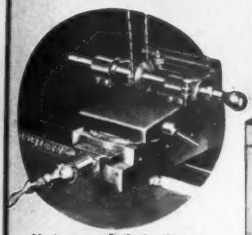
918 PLAIN CABINET LATHE

For

Tool-room — Assembly — Production

Spherical Turning

Automatic Turning



Universal Grinding

The Rivett No. 918 plain cabinet lathe is a versatile machine capable of many operations. In addition to the normal lathe functions of turning, facing, boring and drilling, the 918 can be equipped for milling, grinding, slotting and thread chasing.

The operating conveniences and design features assure efficiency on any operation. Work can be quickly gripped in collet or step chuck or mounted on centers or face plate. Selected spindle speeds are controlled by single lever. Built-in accuracy, correct spindle speed and dynamic balance guarantee finish to closest tolerance.

The machining capacity and producing efficiency of the 918 plain cabinet lathe open many opportunities for its use in the tool-room, assembly and production departments.

Write for bulletin.

SPECIFICATIONS

Swing over bed, dia.	9"
Distance between centers	18"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of tool post slide	5¼"
Slide rest, travel of cross slide	5¼"
Tailstock spindle travel	3½"
Spindle speeds, eight forward and reverse.	
Low range	150-2500 r.p.m.
High range	225-3750 r.p.m.
Weight of lathe, mounting and drive, net 850 lbs.	

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

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- Helical relief maintains constant clearance angles entire life of tool.
- Finish lapped cutting surfaces produce better bores with faster feeds.
- Resharpening confined to one face.
- Down time for regrinding reduced.
- Unskilled help can use tools without loss of efficiency.

BUY WAR BONDS

Send for catalog that shows all sizes and prices. Ask for No. E-1139 for super high speed tools and for No. E-398 for carbide tipped tools.

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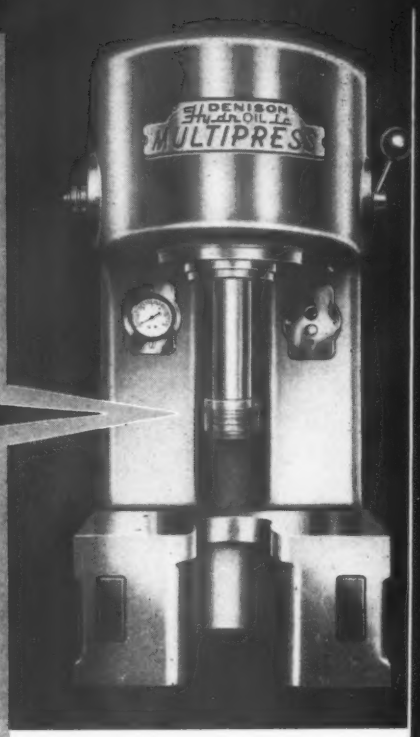
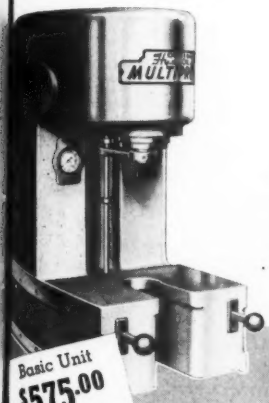
Ram action that permits short, rapidly-repeated uniform pressure strokes of regulative length, frequency, pressure and number per ram cycle



● So many startling advantages have been found in this new *exactly-controlled vibratory ram action* that, thus far, even we know only a few of its potential applications. Performance tests indicate that it may *revolutionize* scores of operations!



Basic Unit
$575.00
Patents Applied For

If your production includes *any* operation which you think might be improved by rapidly-repeated, uniform-pressure strokes, Denison engineers will be glad to adapt Vibratory HydrOILic Pressure to your specific needs! Write for information today!

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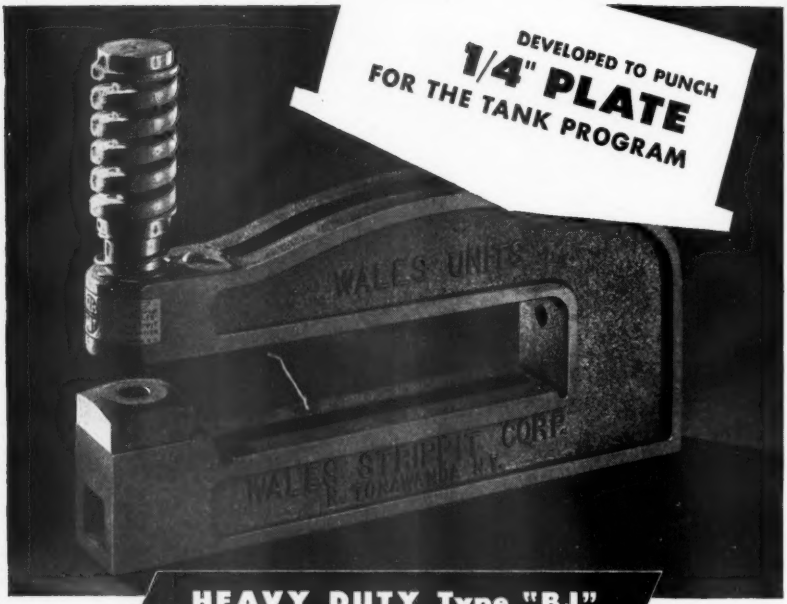

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NOW AVAILABLE TO MANUFACTURERS OF OTHER HEAVY PLATE PRODUCTS

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To
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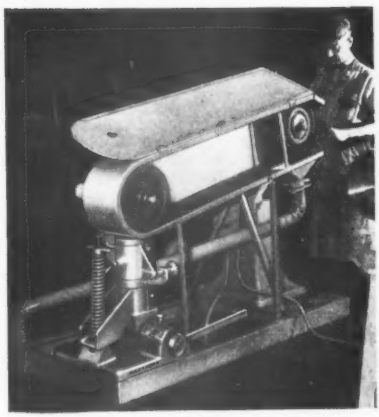

Many manufacturers have definitely determined the greater efficiency and economy of using abrasive belts over set up wheels. There are fewer rejections due to mild scratches, uniform results, less chance of burning or discoloring, lower polishing cost per piece, as a result of increased production. THE MATTISON ABRASIVE BELT BACKSTAND IDLER enables you to take advantage of this method at a very small investment. You use your present lathe and set the Backstand Idler in the rear. For complete information send for our new free circular giving complete details.

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Diamonds are set in overlapping rows, providing a continuous and efficient cutting surface for the life of the tool—without changing, re-setting or adjusting.

Matrix forms a chemical bond with the diamonds, holding them securely until entirely used. Thin blade dissipates heat, safeguards the diamonds.

The effective use of smaller, carefully selected, high quality diamonds permits much lower diamond tool costs, yet assures efficient cutting.

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There is a TRU-LINE tool for every type of straight, profile or step-dressing operation.

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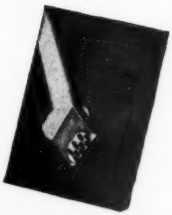
It gives complete information on TRU-LINE tools, shows how they save time and money. Your copy gladly sent on request.



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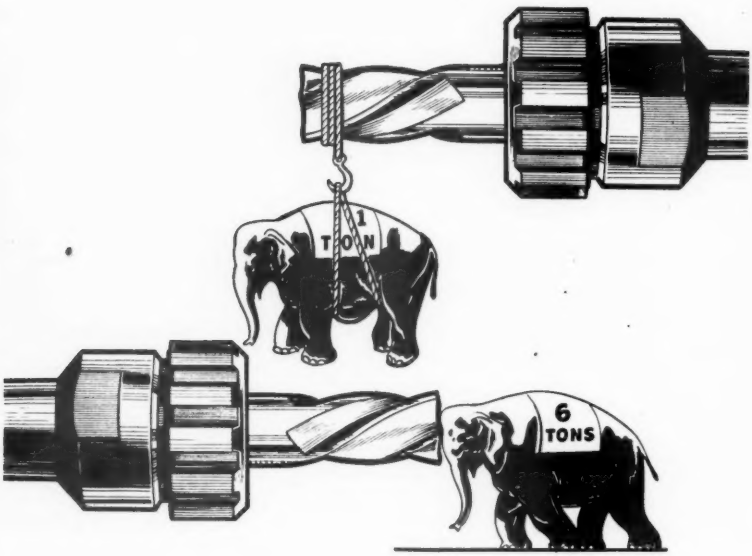

The improved collet in a Universal Collet Chuck grips tools on a continuous surface, instead of at only a few points. It positively locks tools throughout the work operation, securely holding them even under thrust load pressures of 6 tons and radial load pressures of 1 ton. You can use Universal Collet Chucks for drilling, tapping, end milling, reaming, and similar operations at high speed and with heavy feeds, without the danger of having tools loosened by extreme vibration. Write for full information. **ANNOUNCING—NEW TYPE COLLET.** The gripping power of the new Universal Collet is so intense and positive that it will firmly hold tool shanks that are as much as 1/64" undersize.

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TRADE MARK REG.

Step up Production 571%

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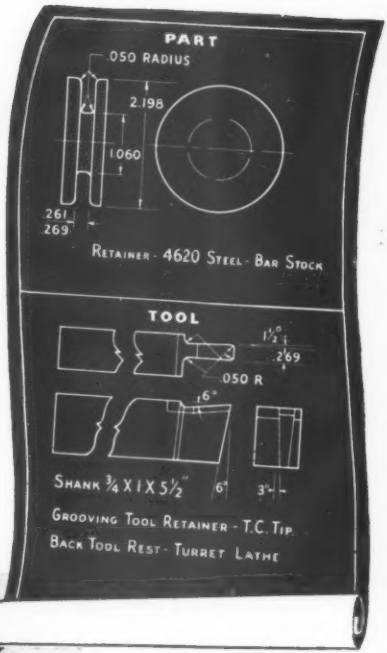
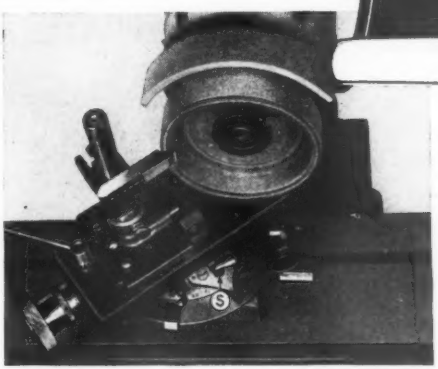
	High Speed Steel	*Radiform Generated Carbide Tool*
Time required to finish cut.....	40 Seconds	7 Seconds
Pieces produced between grinds..	100	400
Finish obtained on part.....	Rough	Polished





Pat. Pending

The tool shown above was made to form the part shown. The first tool was high speed steel, later the same tool was carbide tipped and generated on the Radiform against a diamond wheel.

Left: Radiform set-up for grinding a high speed steel toolbit. Procedure is the same for carbide tools except that a diamond wheel is used.

Information on diamond wheels for this work furnished on request.

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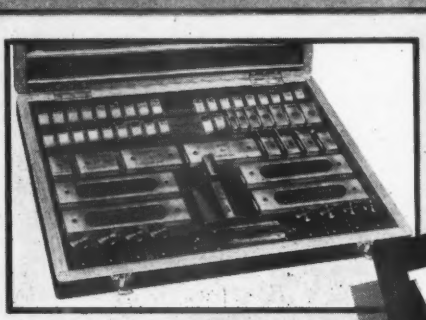

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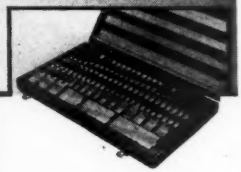
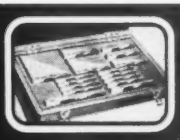


Illustrating a Webber 84-A Standard Inspection Set. 84 blocks in sizes from .050" to 4.000". Accuracy .000004".



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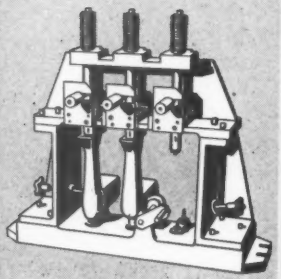

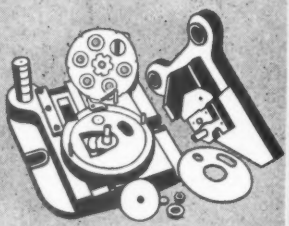

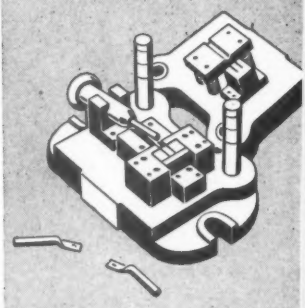

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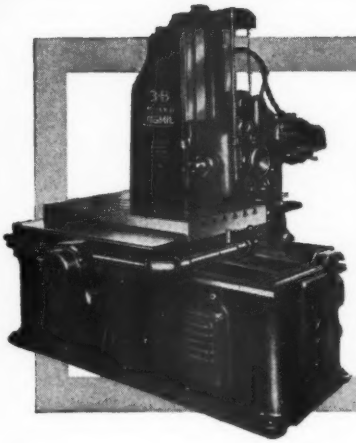

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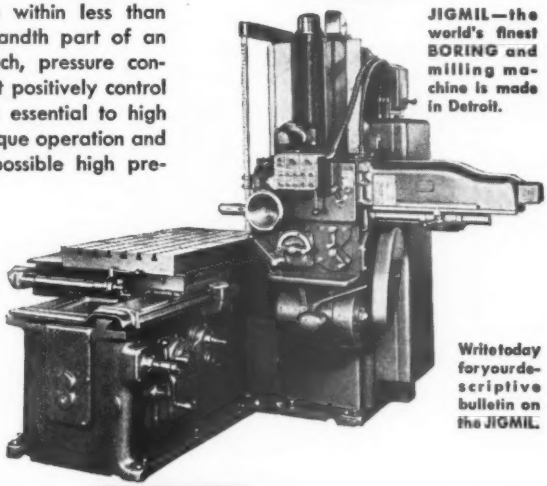

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Designed for rough, semi-rough or finish boring. Chrome nickel steel heat treated and hardened.

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★ Accurate micrometer adjustment for diameters.
★ One set screw locks both cutters.
★ Cutters are identical, permitting interchangeability.

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★ Accurate micrometer adjustment.
★ Cutters are interchangeable with Double Cutter Boring Bar.
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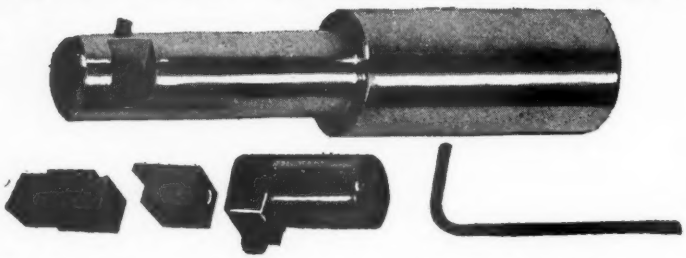

★ Shoulder in insert maintains accurate location point.
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Print sent for making your own bar.
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Cut Cutting Costs with BORCOLOY*

*T. M. REG. U. S. PAT. OFF.

4 *surfaces machined* 1 *Borcoloy Tool Operation*

This NE 8630 Chrome Molybdenum steel "fork", 1.250" in diameter, was formerly machined in four separate operations with complete changes in set-up for turning, facing and cutting. Yet with a BORCOLOY FORM TOOL (ground from a 1" square tipped tool) the daily production has increased 100%. The time now required for the entire job is merely the time for the longest cut.

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BORCOLOY is a centrifugally cast ferrous alloy that incorporates the superior Hardness of heat-treated steel (Rockwell up to C-71) with the "Red Hardness" of Cobalt and the "Wear and Abrasive Resistance" of Boron. A range of 3 grades will thoroughly cover your cutting requirements:

Grade 5 where wear resistance is the principal factor.

Grade 6 for maximum hardness.

Grade 7 to give you high "Red Hardness" for your fast cutting production jobs.

If you are faced with difficult cutting problems, try BORCOLOY TOOLS and prove to yourself how you can machine more material with greater accuracy in less time. *Cut Cutting Costs with BORCOLOY!*

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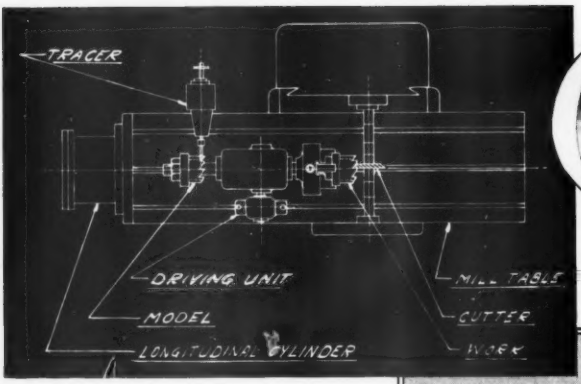

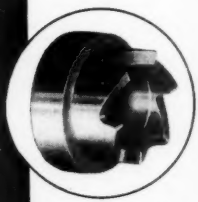

6 teeth of high carbon content steel, $\frac{7}{16}$" in depth and 2½" in diameter, with rounded edges, machined in 3 minutes.

A 60-Minute Job Now Done In 3 Minutes!

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With a Turchan Follower set-up, such as illustrated above, clutch teeth can now be milled automatically on an ordinary milling machine, performing the job in 1/10th to 1/20th of the time heretofore required with a manually operated dividing head.

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Hydraulic Follower Machine

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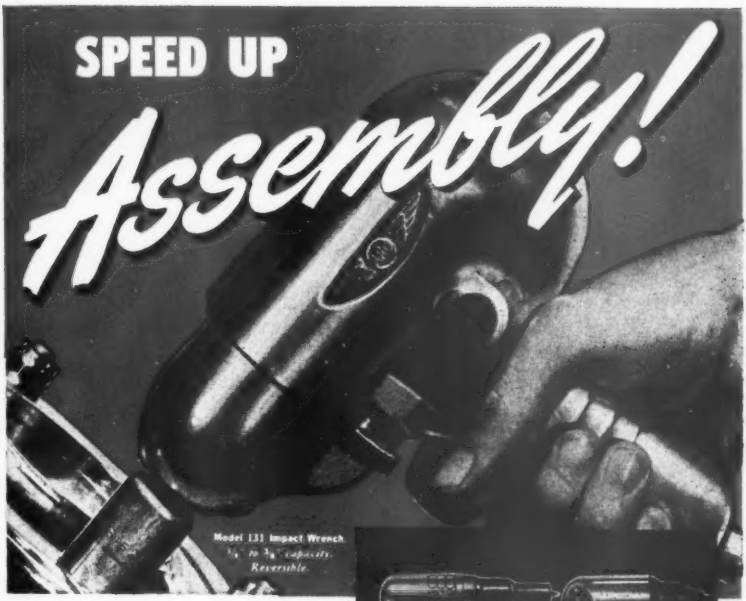

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Straight Shank

CHANGE OVER TO SUBLAND OIL-HOLE DRILLS!

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You'll be surprised at how much faster you can do 2-step drilling with OIL-HOLE Sublands as compared with ordinary subland drills.

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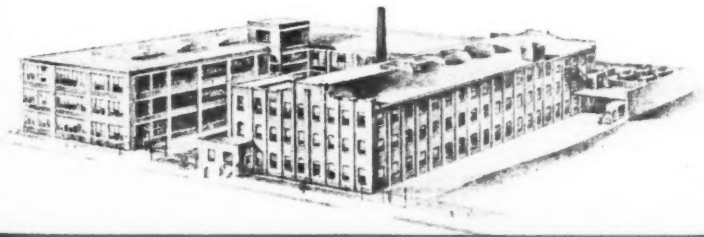

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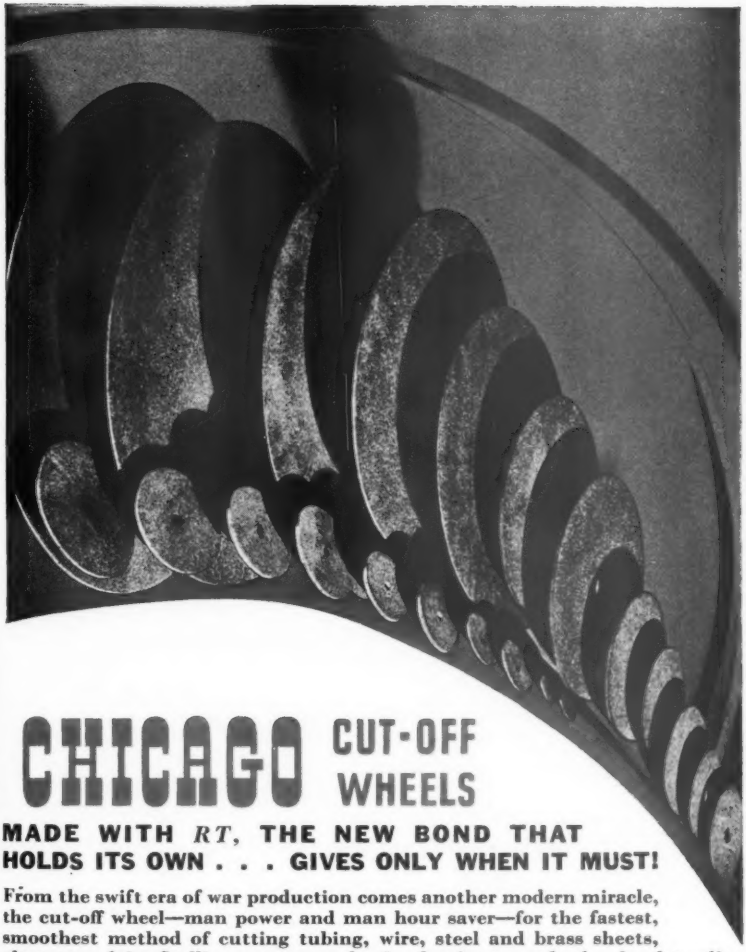

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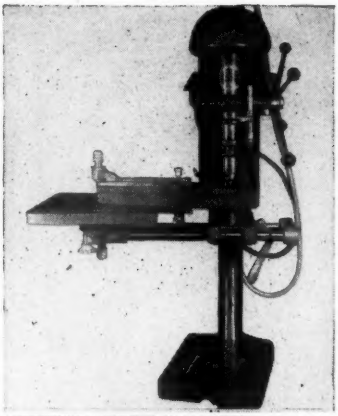

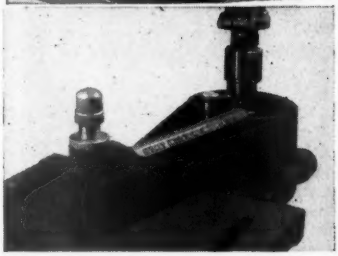

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Fool-proof — labor saving — gets into troublesome places usually reached only with hand tools . . . does in minutes what once took hours! Solves all small radius problems . . .

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- *PERMITS FILING SPEEDS 3 TO 10 TIMES THOSE POSSIBLE WITH STEEL FILES!*
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And now, in addition, it provides these new features *—longer filing surface; quick, easy blade replacement; greater handling convenience.*

The filing surface comprises two 4" long Kennametal blanks which have cylindrical nuts brazed to them, and are attached to the aluminum alloy handle by screws. After long service (up to 200 times that obtained from steel files) the blanks can be readily replaced.

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On the first production run, a Kennametal Lathe File usually saves its cost many times over. Order one—let it demonstrate to you an astonishingly low filing cost-per-piece.

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REPLACEABLE BLANKS

Kennametal blanks are attached by Phillips head screws. Two types are available: fine (30 teeth per inch); and coarse (20 teeth per inch).

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Weighs less than one lb. Can be handled with ease, and used for long periods of time with minimum expenditure of energy.

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Handle is comfortable—it fits the hand; provides secure grip. Opposite end of file provides convenient finger hold.

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CAT. No.	PRICE EACH	CAT. No.	TEETH/ INCH	PRICE EACH
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		F-452	20	7.50

* Furnished with blanks having 30 teeth/inch unless otherwise specified.

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Detail of Sub-Land Combination which reams two diameters, chamfers and spot faces, all at the same time.

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It may be manufactured in any combination of drill, reamer, counterbore, etc., as illustrated.

All Mohawk Sub-Lands incorporate the following features:

Each flute has a perfect circular land, ground from centers and extending over the full distance of the tool, guaranteeing absolute concentricity of steps.

Each step is individually fluted, which gives the tool longer life because the tool may be reground and used its entire length by simply "touching up" the cutting edges as they become dull.

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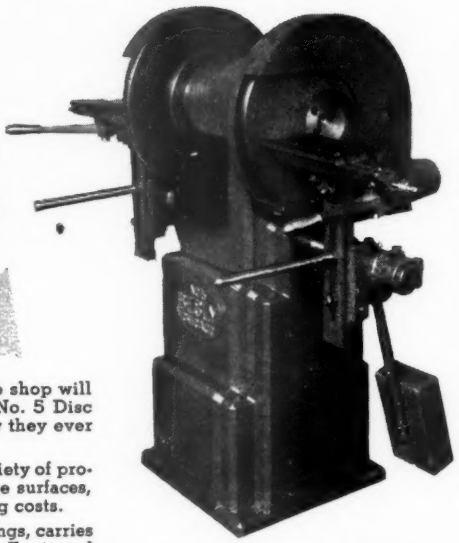

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Spindle, mounted in ball bearings, carries 18" bolted-on abrasive discs. Equipped with the famous Besly "geared lever feed table," this general utility grinder will provide real economies. *Write for full information today.*

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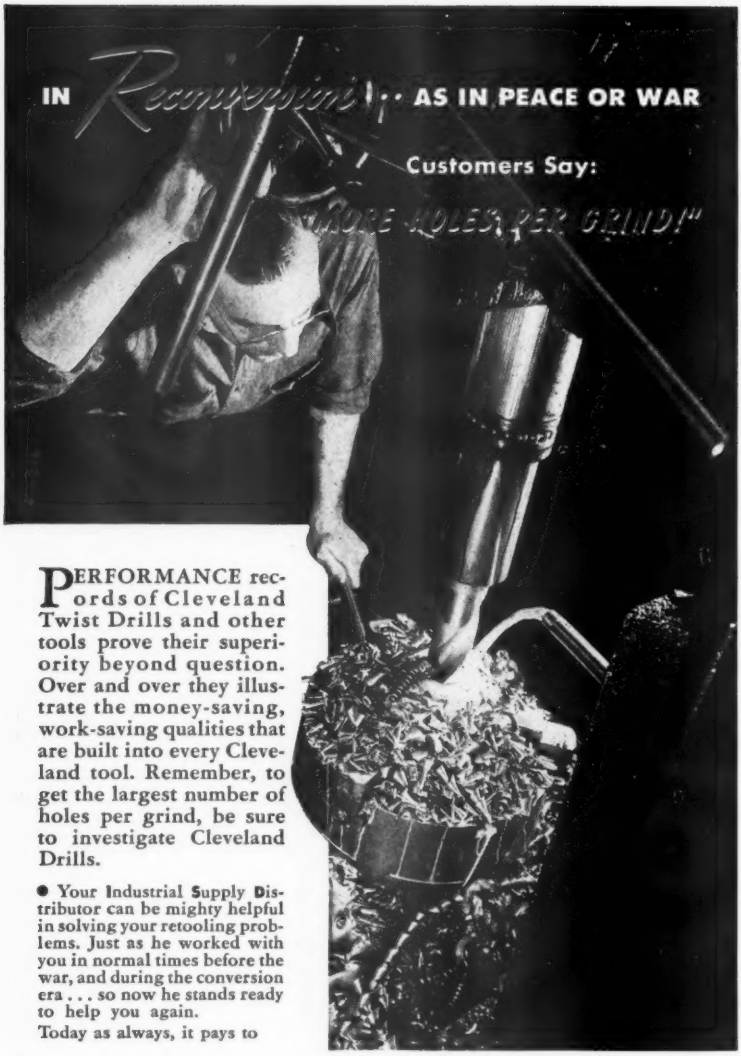

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Editorial

no other few can do so much for so many

Much attention is currently being directed to the problems and status of Small Business. As V-J Day, according to varying but well authenticated opinions, looms within three to eighteen months, the realization is driven home that the ranks of small business are going to be swelled to an extent never experienced in the history of our peacetime economy.

The defining of Small Business is strictly relative, therefore most difficult of tangible expression. For some governmental purposes the annual sales figure of $500,000 is taken as the demarcation between Small Business and Big Business.

Be that as it may, we much prefer to divorce cold blooded statistics and dollar signs from our deliberations and would rather think of Small Business in terms of free enterprise and individual effort.

Using this approach, then, can it not be said, in regard to business in general, large or small, that actually the smaller the business the more an individual's whole effort is embodied in the end result, work or product? Furthermore, regardless of the bigness of big business, it is more often true than not, that the consumer contact is maintained through the smallest segment of small business! Let us take, as an example, the publishing and distributing of our daily news. Here is big business that could well be spelled with all capital letters; and we could gather a maze of statistics and dollar signs concerning its plant and equipment, paper and ink tonnage, number of employees, miles of leased wires, etc., etc., that would stagger the layman. But what is the import of such statistics as compared to the familiar "plop" of the evening paper tossed against the front door? Be it Big Business or Small Business, in the mind of the customer the evening paper is the kid down the street and the kid down the street is the evening paper.

Limited by time and physical capacity, our paper boy serves but a relatively few subscribers. The man who operates the milk route with his specialized delivery vehicle serves more people over more miles. Consider next the small business establishment proprietored by an individual or family. It may be that of a dry cleaner, drug store, furniture store, automobile agency or any of the hundred and one store fronts that constitute Main Street, U.S.A. They all represent the enterprising efforts of individuals in developing their own markets; trading their own skills or products for other peoples' buying power.

The foregoing is but a buildup or approach to our favorite subject, that highly skilled artisan for whom we always carry the torch, the tool and die maker. Whether he functions as a proprietor or as an employee we insist upon thinking of the tool and die maker and all that his craft and skill encompass as one of the principal springboards of free enterprise. He is representative of several thousand shops, with only a comparative few having as many as one hundred employees, and the industry-wide average probably being less than fifty workers. Their special skills have been called the cornerstone of mass production and this applies equally to war production and peacetime manufacture.

The war production record of these designers and builders of special tools and dies is one of which they can justly be proud. At the outset of our defense program they were not accorded the recognition that was due them. Even prior to Pearl Harbor, critical bottlenecks had appeared that were threatening the overall armament program. Naturally we know something of the contributions made by the Contract Tool & Die Industry because its nation-wide facilities were among

those assigned to our own George Huebner and his Washington staff, serving on small tools procurement.

There is an interesting, unofficial sidelight to his endeavors in conjunction with the tool and die industry. When the Office of Production Management, the War Production Board's predecessor, prior to Pearl Harbor drafted him for wartime public service, the appeal was made in part because of "your intimate knowledge of the locations, abilities and facilities of small tool and die shops." Frequently the smallest of them were thought about and spoken of as "alley shops." George Huebner's acceptance of this assignment included the determination to disassociate the term "alley shop" from the tool and die industry in the minds of Washington and of all industry. This objective was attained with the realization, through demonstration, that the tool and die maker truly occupies a key position in the mass production of war materiel.

Repeatedly, these smaller units of industry with their more pronounced operating flexibility made and delivered tools in such incredibly short periods of time that critical war production could begin weeks and sometimes months earlier, or a threatened bottleneck be averted or an actual one broken.

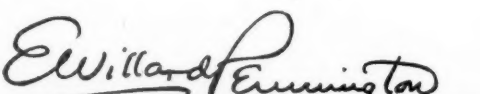
Tools, gages, dies, molds, jigs and fixtures were not the only tooling thus provided. Twist drills, reamers, end mills and cutting tools of every description, standard and special, were supplied by the smaller plants when larger units had order backlogs a block long. Frequently such tool shops and tool manufacturers would undertake parts machining at the drop of the hat, and the Army, Navy and Air Force were able to continue a vital experimental project.

Throughout reconversion and the peacetime production now beginning, the tool and die manufacturer will be called upon to spark the pent-up explosive charge of consumer goods demand that is aimed at providing jobs in mass manufacture, distribution and service.

The special tools, dies and fixtures that result from the toolmakers' skills have been and are still being used in large numbers on the machine beds and tables of the longest war production and assembly lines in the biggest manufacturing plants. Likewise in the postwar production, the strategic, key importance of the tool and die maker cannot be over-emphasized. New products, new jobs, freight and express volume, sales commissions, store and home rentals and new construction will result in postwar prosperity only when, and not until, the tool and die maker has performed his function of creating the new and special tooling that will transform the planners' blueprints into realities.

And when manufacturers of the first models of automobiles, refrigerators, washing machines and countless other items begin to feel the pinch of competition, they will again call in the designers and builders of special tools, dies and machinery. New products and parts designs will require new tooling. Lower selling prices will necessitate reduced costs of manufacture, hence new tooling. New materials will become available and they will call for new tools and different techniques. Changed contours will require new dies, redesigned parts, new jigs, fixtures and even new and faster special production machines. Gages and gaging fixtures and other mass production accessories will have to be changed and withal, the tool and die shop operator and his comparatively small group of highly skilled craftsmen will continue to be the men of the hour.

Can it not then be justifiably said, in paraphrase, that no other few can do so much for so many?



editor

Deep Drawing Filter Cases

Part II

This series of articles describes the deep drawing press work performed by the Bellevue Manufacturing Company in producing the cases for Fram Oil Filters. The tooling described last month was that of a two-operation draw, whereas the following production operations cover the blanking and three-operation draw of the Type F-31 Fram Filter.

by Carl J. Nagel

The body shell for the Fram Oil Filter, Type F-31, shown at the right below, is made of a pickled and oiled, low carbon drawing steel. It is blanked out from flat strip stock, .093" thick to a 15" diameter on a Toledo press.

This is followed by three drawing operations. The first which reduces the blank to a shell of 9" OD and 5½" depth is done on a Verson, T-30, 100-ton press; the second draw, producing a shell of 7¼" OD and 7" depth, is run on a Verson, T-6-30, 100-ton press, and the third and last draw which gives the work its final dimensions of 5" OD by 9½" deep is done on a Bliss 5-A press.

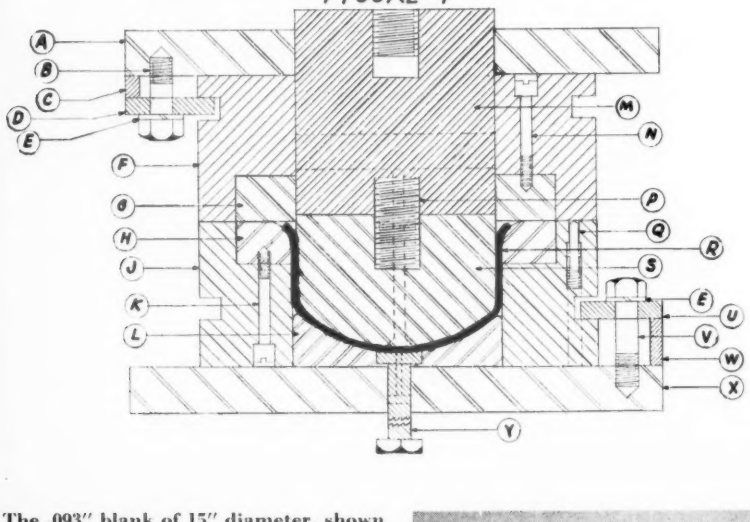
Figure 4 shows the upper and lower die construction and bill of materials, and immediately below is a photograph

A nest of workpieces, above, representing the four operations (one blanking and three drawing) involved in producing the case for the Fram Oil Filter, Type F-31, right. The .093" x 15" blank is successively reduced to a shell of first, 9" OD by 5½" deep, next 7¼" OD by 7" deep, and finally, 5" OD by 9½" deep. A cherry red anneal is given the top half of the cases between the second and third draws.

BILL OF MATERIALS			BILL OF MATERIALS		
DET.	DESCRIPTION	REQ.	DET.	DESCRIPTION	REQ.
A	UPPER BOLSTER PLATE	1	G	TOOL STEEL DIE RING UPPER	1
B	STD. HEX. HD. CAP SCREW	4	H	TOOL STEEL DIE RING LOWER	1
C	STEEL CLAMP SUPPORT	4	J	MACH. STEEL LOWER DIE BLOCK	1
D	STEEL CLAMP SUPPORT	4	K	STD. CAP SCREW	4
E	STD. 1" LOCK WASHER	8	L	TOOL STEEL BOTTOMING PAD	1
F	MACH. STEEL UPPER DIE BLOCK	1	M	MACH. STEEL PUNCH ADAPTER	1

BILL OF MATERIALS			BILL OF MATERIALS		
DET.	DESCRIPTION	REQ.	DET.	DESCRIPTION	REQ.
N	STD. CAP SCREW	4	V	STD. HEX. HD. CAP SCREW	4
P	2"x4" STEEL STUD	1	W	STEEL CLAMP SUPPORT	4
Q	C. R. STEEL LOCATOR PIN	3	X	LOWER BOLSTER PLATE	1
R	PICKLED & OILED H.R. MATERIAL STOCK	1	Y	STD. 1" MACH. BOLT	1
S	TOOL STEEL PUNCH	1			
U	STEEL CLAMP SUPPORT	4			

FIGURE 4



The .093" blank of 15" diameter, shown below, is reduced by three drawing operations to the final 5" OD and 9½" depth of the completed filter case or body.

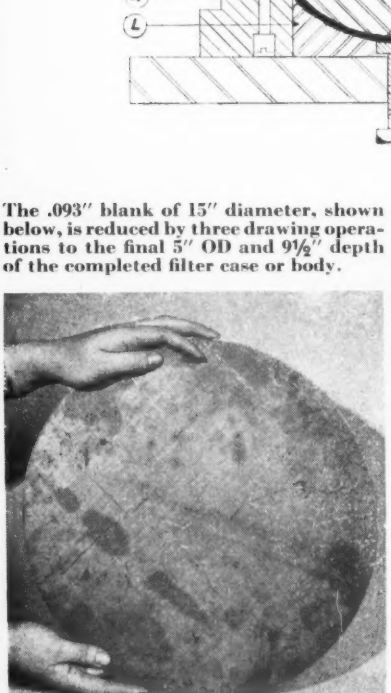


Figure 4, above, details the tooling and bill of materials for the first operation draw which is run on a Verson T-30, 100-ton press. The shell, resulting from the first draw, of 9" OD by 5½" depth is shown next below.

of the work at the end of the first drawing operation.

First-Operation Draw

The 15" diameter blank is coated with a lard oil composition deep drawing lubricant and is placed on the hardened and ground tool steel die ring, detail H, Figure 4. It is accurately located in relation to the die opening by means of ¼" diameter, spring mounted, cold rolled steel locator stop pins. Three stop pins are used, equi-spaced around the 15" work diameter, one of which is shown by detail Q, Figure 4.

The lower tool steel die ring, detail H, is bolted to the machine steel die holder, detail J, by means of four ½" hex-headed socket cap screws, detail K. This mounting is done from below, through the die holder into blind holes in the underside of the die ring. This design avoids any bolt openings in the surface face of the die ring which might mar or distort the work as it is drawn over the face of the die ring in the first operation.

The die holder, detail J, is securely clamped to the lower bolster plate, detail X, by means of the steel clamping and clamp supporting pieces, details W and U, in combination with standard 1" hex-head cap screws and lock washers, detail V. Four of these clamping assemblies are used in fastening the die holder to the bolster plate.

The hardened and ground tool steel punch, detail S, Figure 4, is designed to be used with the machine steel punch adaptor, detail M. The two are bolted together with a standard 2" stud, detail P. The punch and punch adaptor assembly is given a slight taper of about 2° included angle (1° to each side) to facilitate stripping the work from the punch at the completion of the draw. Note also, in connection with removing the work from the punch, that suction is prevented by means of an air relief provided by the ½" hole drilled through the punch and the 2" stud, and the 1" hole through the punch adaptor.

The upper die holder, of machine steel, detail F, Figure 4, is clamped to the upper bolster plate, detail A, by four standard 1" hex-head cap screws and lock washers, details B and E, in combination with the built-up steel clamping and clamp supporting pieces, details C and D. Both upper and lower die holders are grooved as shown to provide for clamping to the respective bolster plates.

The upper die ring, of tool steel, hardened and ground, detail G, is bolted to the die holder, detail F, by through bolts from the die holder. As in the case of the lower die ring design, this is to avoid any bolt openings in the face of the die ring which could score the surface of the blank as it is forced over the die rings during the course of the draw.

The hardened and ground tool steel bottoming punch and filter case knockout bolt assembly are shown by details Y and L. Note also, in detail Y, the air vents drilled to prevent suction from affecting easy work removal. Figure 4 shows the work and tooling at the bottom of the draw stroke. The 15" diameter blank has become a shell of 9" OD and 5½" depth. After ejection from the first operation press the filter cases are fed by gravity chute to the second operation.

Second-Operation Draw

The tooling and bill of materials for the second draw are detailed in Figure 5, and the work as it has become shaped at the end of the press travel is shown by detail T and the photo immediately below.

View of filter shell at completion of second draw showing cupped bottom.

BILL OF MATERIALS			BILL OF MATERIALS		
DET.	DESCRIPTION	REQ.	DET.	DESCRIPTION	REQ.
A	STD HEX HD CAP SCREW	4	G	UPPER TOOL STEEL PUNCH	1
B	STEEL CLAMP SUPPORT	4	H	TOOL STEEL DIE RING	1
C	STEEL CLAMP SUPPORT	4	J	STD ½" CAP SCREW	4
D	STD 1" LOCKWASHERS	8	K	STEEL CLAMP SUPPORT	4
E	STD ⅝" CAP SCREW	4	L	STEEL CLAMP SUPPORT	4
F	MACH. STEEL PUNCH ADAPTER	1	M	STD HEX HD CAP SCREW	4

BILL OF MATERIALS			BILL OF MATERIALS		
DET.	DESCRIPTION	REQ.	DET.	DESCRIPTION	REQ.
N	TOOL STEEL BOTTOMING PAD	1	U	MACH. STEEL DIE BLOCK	1
P	STD. MACH. BOLT	1	V	TOOL STEEL PUNCH	1
Q	UPPER BOLSTER PLATE	1	W	BOTTOM BOLSTER PLATE	1
R	MACH. STEEL UPPER DIE BLOCK	1			
S	2"x 4" STEEL STUD	1			
T	PICKLED & OILED H.R. MATERIAL STOCK	1			

FIGURE 5

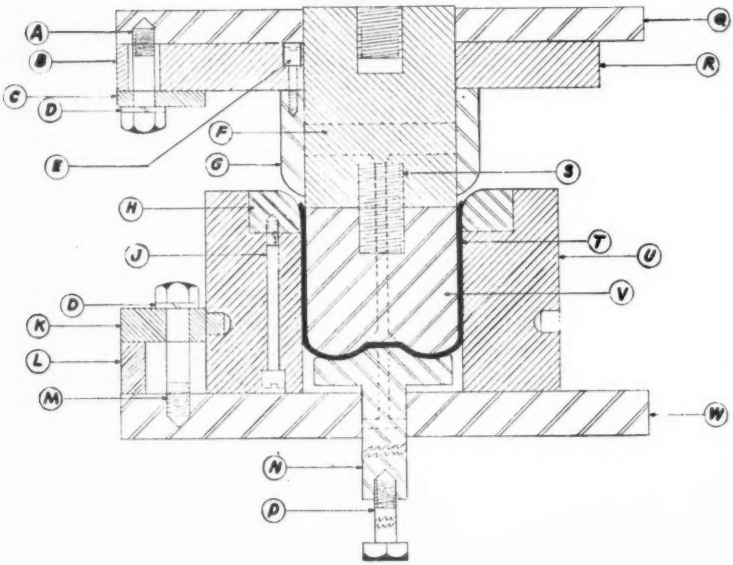


Figure 5, above, shows in detail the construction of the tool members and the parts list for the second drawing operation. This is done on a Verson T-6-30, 100-ton press to which the first-draw cases are fed by gravity chute. In the second operation the case is drawn to 7¼" OD and 7" depth and is shown at right corresponding to its form in the press as indicated in the tool drawing.

The illustration on page 101 is a side and end view of the workpiece and best shows the cupped bottom of the shell as formed by the punch and pad profile, Figure 5.

The cupping of the bottom of the work in the course of the second draw is done for the purpose of gathering a sufficient amount of material within the area or confines of the lower end of the shell to

be "taken away" by the next draw to the places where needed in order to complete the final shape. This is one of the most important, if not the most important consideration in tooling for the deep drawing of metals. The limit of plasticity or flow of a given material must be recognized and anticipated, as is here done, in the tooling design. When we want to draw metal to a point or location beyond that to which it can be stretched or made to flow, an intermediate stop must be made along the route in order to, figuratively, pull in our belt and get a second wind. Accordingly, the concavity of the bottom of the shell as shown in both Figure 5 and the photograph on page 101 is purely for the purpose of storing up some metal for the balance of the journey, i. e., the final shape to be attained at the end of the third and final draw.

It is well to review briefly the difference between the drawing job described last month and this one. The case for the F-4 filter is of .062" stock, whereas the F-31 case is 50% heavier or .093". The F-4 was drawn in two operations from a 10⅞" diameter blank to final dimensions of 4⅝" OD by 6¼" deep; the F-31 blank, larger and heavier, i. e., 15" diameter by .093" thick is more severely drawn by three operations to its final size of 5" OD by 9½" deep. In the first instance we have a diameter to length ratio of 1 to 1.35; in the second the ratio is 1 to 1.9 and involves a relatively greater increase in the stock thickness. The bottom of the F-4 shell was capped at the end of the first draw for the same reason as in the design of the tooling for the F-31. Because of the lighter weight stock involved, the final shape of the bottom of the F-4 case had reinforcing ribs impressed by the punch and pad in the final draw, Figure 3, Tool & Die Journal, July 1945, page 102. The stock from which the F-31 case is drawn is sufficiently heavier so that reinforcing ribs are not needed. Also, the final shape of the bottom of the F-31, being more convex than the F-4, is another factor in precluding the necessity for reinforcing ribs.

Referring to Figure 5, the machine steel lower die holder, detail U, is grooved when on the lathe to permit clamping and bolting to the bottom bolster plate, detail W. Details K and L, and M and D show the clamping assembly to steel clamps, clamp supports, standard 1" hex-head cap screws and lock washers. Four clamping assemblies are used.

The hardened and ground tool steel die ring, detail H, is bolted from below to the die holder by four ½" screws, detail J. Here again, bolt openings in the highly polished surface of the die ring are to be avoided.

The tool steel punch, hardened and ground, detail V, is designed in combination with the machine steel punch adaptor, detail F. The two are bolted together by means of the 2" standard steel stud, detail S. The punch adaptor is drilled through with a 1" hole, and a ½" hole is drilled through the punch, stud and into the adaptor punch hole. These provide an air relief and prevent the creating of a suction that would make difficult the stripping of the work from the punch.

The punch and punch adaptor assembly is tapered to approximately 2° (1° each side) to further insure ease in stripping the filter cases from the punch.

The upper die holder shoe, of machine steel, detail R, is clamped to the upper bolster plate, detail Q, by means of the four clamping assemblies made up of the plain steel clamps, clamp supports, standard 1" hex-head cap screws and lock washers, details A, B, C and D.

The hardened and ground tool steel pilot punch, detail G, is bolted to the upper die holder shoe by four standard ½" cap screws, detail E. Due to severe wear and occasional breakage at the bottom radius point of the pilot punch, the present construction involving pilot punch and machine steel die holder shoe is a redesign directed toward keeping tool replacement cost at a minimum. In the original design the pilot punch and upper die shoe were one component of tool steel.

Detail N is the hardened and ground tool steel bottoming pad or punch, so designed that in combination with the standard 1" machine bolt it serves also as the knockout for ejecting the work from the die.

At the completion of the second operation draw, the work, detail T and photo below Figure 5, has been brought to 7¼" OD and 7" in depth.

To be continued next month

Economical Jigs and Fixtures For Short Run Production

In tooling up for a short run of 100 aircraft parts it was required to make practical and economical jigs and fixtures of a conservative design in order to meet, nevertheless, the requirements of a production schedule. The product as shown in Figure 1 is a bronze electrical fitting on which four operations are to be performed: a lathe operation, one milling operation, and two drilling operations. An outline of the product is shown in chain lines on each drawing to indicate its relative position in the tool.

by Alex S. Arnott

Turning Fixture

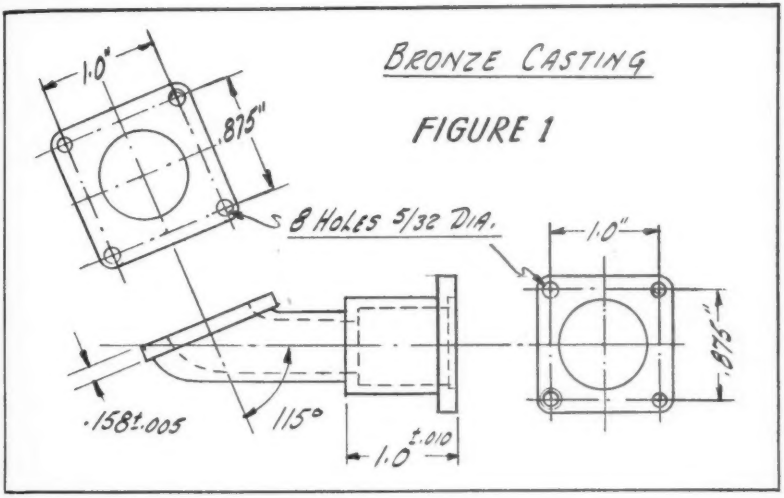
The first operation to be performed is the lathe operation for which the fixture shown in Figure 2 was designed. It was suggested that a standard three jaw chuck could be used for this operation but, due to the irregularities in the bronze casting and the serrated teeth of the chuck jaws, it was decided to design a special fixture for holding the work.

The design of this fixture allows the adjustment of the center through the center line (A) and provides an adjustable holding clamp to follow up the location adjustment. The body of the fixture has a boss (B) which is ground to fit the spindle nose of the lathe and the body is held to the lathe with three bolts through the holes (C). The brackets (D) and (E) provide a smooth sliding surface for the vee blocks (F) and (G), and are both permanently fixed to the face plate with screws and dowels. The locating vee block (F) is swivelled to the screw (H) which advances the vee block through the screw thread in the block (D). The vee block may be held in a permanent position by using the locknut (J). The clamping block is arranged in a similar manner except for the locknut. The vee block may be advanced to hold the work by means of the screw (K). Should the diameter of the casting be over or under size, the vee block takes care of the variation. The hole (L) is bored through the face plate to accommodate the length of the part, sufficient allowance being made to move the casting up or down with the adjustment of the vee blocks. The clamping and adjustable screws (H) and (K) may be provided with hexagonal heads, assuring greater tightening power if necessary.

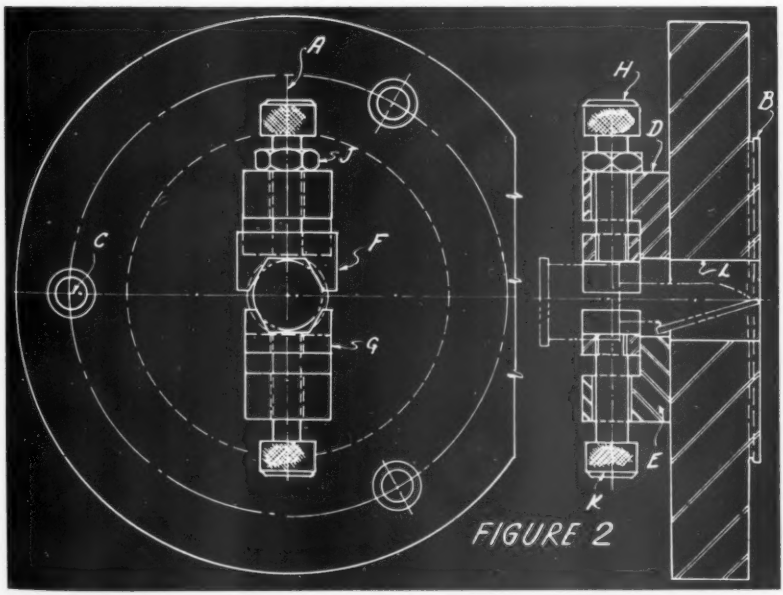
The knurled head shown in the present design provided sufficient clamping power and eliminated the use of a turning wrench, thus increasing the speed of the operation.

Milling Fixture

The fixture shown in Figure 3 holds the part for the next operation which is to mill the face of the flange (X). The body of the fixture is a flat base with two hold-down bolt slots and keys suitable for the table of the milling machine. The part is located in a special vee block (A) into which the round part of the bronze casting fits. The top of the vee block is ground parallel so that the under face of the flange may rest on it and provides a parallel surface for the cutting operation on the face of the flange. A set block (B) is fastened to the corner of the base and is used with a .020" feeler to set the milling cutter the correct height in relation to the work when



The above bronze workpiece, an aircraft part, involved a production run of only 100 pieces, hence the greatest economy in jig and fixture design was in order. The simple, equalizing and easily loaded first operation fixture is shown below as designed for lathe spindle mounting.



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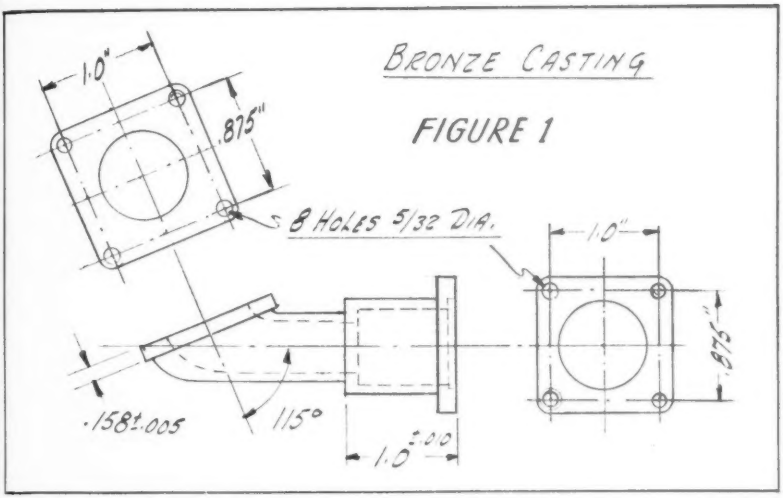

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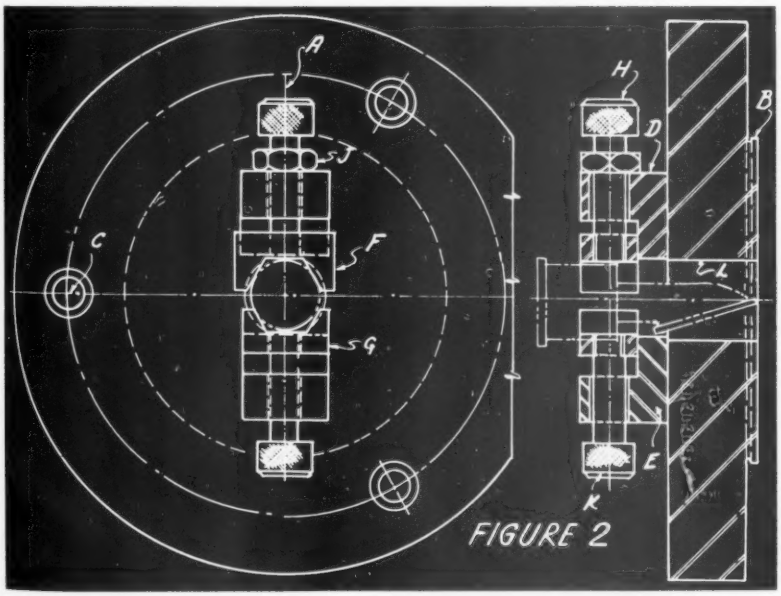


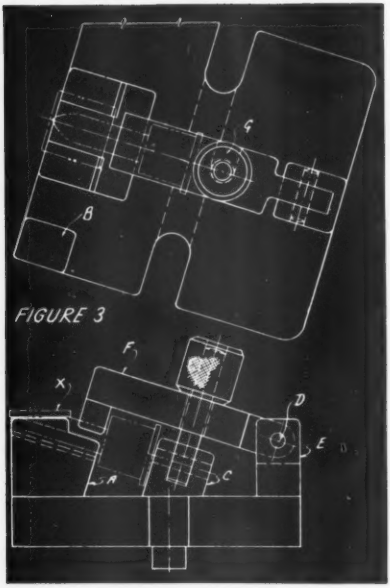


FIGURE 3

it is loaded into the fixture. This set block has been omitted in the front view of the drawing to prevent confusion with the height of the special vee block (A). A locating block (C) is provided to locate the casting by its opposite end, thereby preventing it from sliding down the vee block.

To clamp the work into position, a swinging bar clamp (F) is hinged on the pin (D) which is supported on the bracket (E). The other end of the bar is ground with a vee to fit over the circular section of the work, an undercut being made for the bar to clear the end of the part. In order to hold the clamp in this position, a swinging stud, hinged to the block (C) and with a knurled knob on the opposite end, is swung upwards through the slot (G) and when it is in a perpendicular position, the knurled knob is advanced by means of the screw on the stud until the clamping bar is brought to bear upon the work, holding it firmly against the vee block and preventing it from lifting up during the cutting operation. Plenty of clearance must be allowed in the slot (G) for the stud to move freely regardless of the position of the clamping bar.

With the work in this position, the operation is ready to be performed.

First Operation Drill Jig

A drill jig to handle the first drilling operation is shown in Figure 4. The body is a right angle casting with four standard jig feet inserted into the base. These are ground at the time of assembly in order to insure a parallel surface for the operation.

To support and locate the work in the jig, the two blocks (A) and (B) are used. The location block (A) has a vee similar to the one in Figure 3. This block is fastened to the base with screws and dowels and supports the work throughout its length. A stop block (B) has a machined locating ring (C) which is a good machine fit for the recess machined in the casting during the lathe operation previously described. The drill jig leaf (D) is pivoted on the hinge pin (E) which is supported in the body of the jig through the bored holes (F). A slot is cut into the body and the lid is snugly fitted to it. The four headless drill bushings are pressed into the leaf with the correct centers thus completing the construction of the tool. In operation the work is placed into the vee block (A) locating the end on the ring (C). The lid (D) is then swung into position and the work is ready to be drilled.

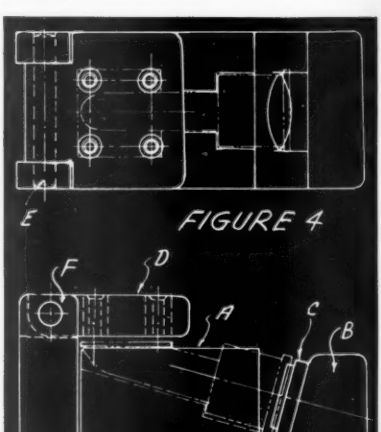
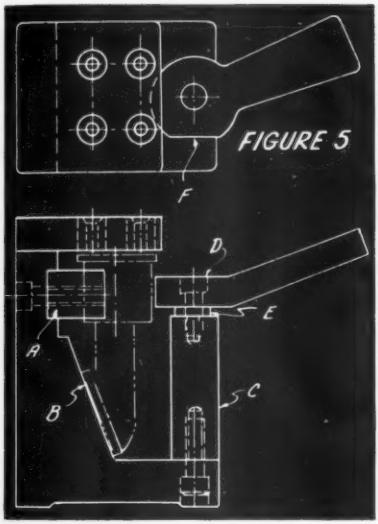


FIGURE 4

It will be observed that the corner of the lid (D) is rounded on one side only, the other corner being left square. The reason for this is that when the lid is lifted the round corner will allow the lid to swing on the hinge pin, but when it has been completely raised the unrelieved corner prevents it from proceeding further, thus stopping the lid from flipping over completely.



Second Operation Drill Jig

In the second drilling operation, the bronze casting must be located from the holes drilled in the first drill jig. The drill jig for this operation is shown in Figure 5. The body of it is made from machine steel and has a supporting vee block (A) attached with screws and dowels. Two special diamond shaped pins indicated at (B) are inserted in the body of jig to locate the work from the previously drilled holes, and a cam actuated clamp is fastened to the support (C) by the shoulder screw (D). A spacer (E) is inserted to give the cam a smoother surface on which to operate and also to allow for wear. The bushing plate, into which four headless press fitted bushings are inserted, is fastened to the upper part of the body and is spaced so that there is a clearance of approximately 1/16th" between the plate and the top surface of the casting. The cam is relieved at point (F) so that when the cam is open as much space as possible is provided for removing the work from the jig.

In operation, the work is inserted into the jig through the end, with the bronze casting holes located over the diamond pins and with the body of the work resting in the vee on the supporting block. The cam lock is then turned to the closed position thereby holding the work firmly against the support and preventing it from moving in any direction during the operation.

Where Do We Go From Here?

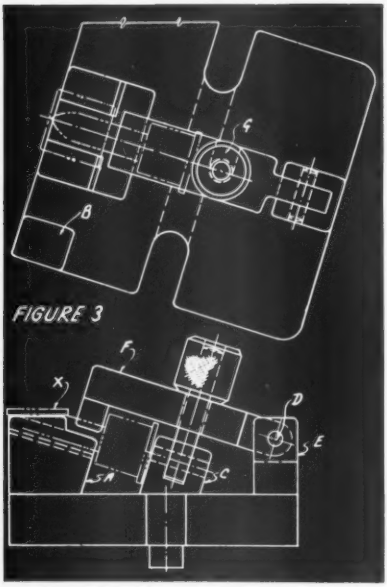
A complete engineering graduate training course permitting exploration by the graduate engineer of production, sales, research, design, field work, administration and many other elements of industrial operation is outlined in a new training brochure, "Where Do We Go From Here?", recently published by the Allis-Chalmers Mfg. Co.

Based on the theory that an engineer finds the right job by working at several, the two-year training course coordinates shop and office work in a program designed to fit individual aims and abilities. In applying this plan, the graduate engineer is given great flexibility in laying out his course. After discussion of experience, aptitudes, and preferences with an experienced advisor, a training schedule with a related sequence of jobs is projected. In progressing from one job to another the individual's ideas may change, in which case his course is modified to coincide with the new objectives.

Recently inaugurated, an Allis-Chalmers program of graduate study in cooperation with the Illinois Institute of Technology is also discussed. The program involves professional and technical education on the graduate school level, leading to a master's degree.

Booklet No. E6085-A is available by request from Allis-Chalmers Mfg. Co., Dept. T-5, 569, Milwaukee 1, Wis.

INFORM-A-GRAM KEY No. 183.5-B



it is loaded into the fixture. This set block has been omitted in the front view of the drawing to prevent confusion with the height of the special vee block (A). A locating block (C) is provided to locate the casting by its opposite end, thereby preventing it from sliding down the vee block.

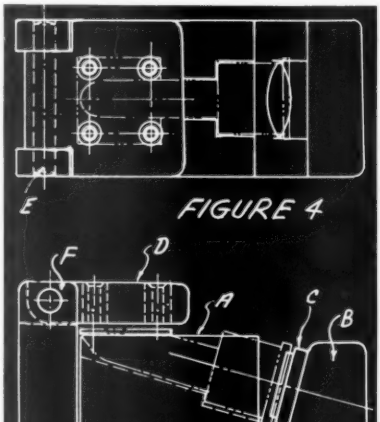
To clamp the work into position, a swinging bar clamp (F) is hinged on the pin (D) which is supported on the bracket (E). The other end of the bar is ground with a vee to fit over the circular section of the work, an undercut being made for the bar to clear the end of the part. In order to hold the clamp in this position, a swinging stud, hinged to the block (C) and with a knurled knob on the opposite end, is swung upwards through the slot (G) and when it is in a perpendicular position, the knurled knob is advanced by means of the screw on the stud until the clamping bar is brought to bear upon the work, holding it firmly against the vee block and preventing it from lifting up during the cutting operation. Plenty of clearance must be allowed in the slot (G) for the stud to move freely regardless of the position of the clamping bar.

With the work in this position, the operation is ready to be performed.

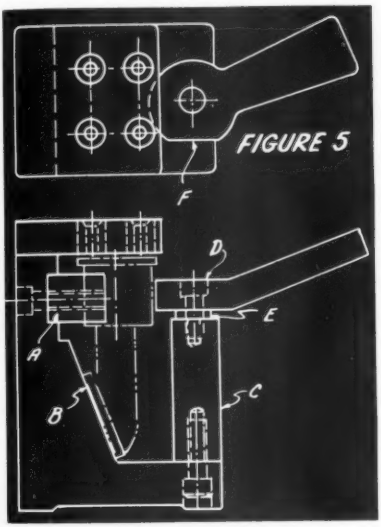
First Operation Drill Jig

A drill jig to handle the first drilling operation is shown in Figure 4. The body is a right angle casting with four standard jig feet inserted into the base. These are ground at the time of assembly in order to insure a parallel surface for the operation.

To support and locate the work in the jig, the two blocks (A) and (B) are used. The location block (A) has a vee similar to the one in Figure 3. This block is fastened to the base with screws and dowels and supports the work throughout its length. A stop block (B) has a machined locating ring (C) which is a good machine fit for the recess machined in the casting during the lathe operation previously described. The drill jig leaf (D) is pivoted on the hinge pin (E) which is supported in the body of the jig through the bored holes (F). A slot is cut into the body and the lid is snugly fitted to it. The four headless drill bushings are pressed into the leaf with the correct centers thus completing the construction of the tool. In operation the work is placed into the vee block (A) locating the end on the ring (C). The lid (D) is then swung into position and the work is ready to be drilled.



It will be observed that the corner of the lid (D) is rounded on one side only, the other corner being left square. The reason for this is that when the lid is lifted the round corner will allow the lid to swing on the hinge pin, but when it has been completely raised the unrelieved corner prevents it from proceeding further, thus stopping the lid from tipping over completely.



Second Operation Drill Jig

In the second drilling operation, the bronze casting must be located from the holes drilled in the first drill jig. The drill jig for this operation is shown in Figure 5. The body of it is made from machine steel and has a supporting vee block (A) attached with screws and dowels. Two special diamond shaped pins indicated at (B) are inserted in the body of jig to locate the work from the previously drilled holes, and a cam actuated clamp is fastened to the support (C) by the shoulder screw (D). A spacer (E) is inserted to give the cam a smoother surface on which to operate and also to allow for wear. The bushing plate, into which four headless press fitted bushings are inserted, is fastened to the upper part of the body and is spaced so that there is a clearance of approximately 1/16th" between the plate and the top surface of the casting. The cam is relieved at point (F) so that when the cam is open as much space as possible is provided for removing the work from the jig.

In operation, the work is inserted into the jig through the end, with the bronze casting holes located over the diamond pins and with the body of the work resting in the vee on the supporting block. The cam lock is then turned to the closed position thereby holding the work firmly against the support and preventing it from moving in any direction during the operation.

Where Do We Go From Here?

A complete engineering graduate training course permitting exploration by the graduate engineer of production, sales, research, design, field work, administration and many other elements of industrial operation is outlined in a new training brochure, "Where Do We Go From Here?", recently published by the Allis-Chalmers Mfg. Co.

Based on the theory that an engineer finds the right job by working at several, the two-year training course coordinates shop and office work in a program designed to fit individual aims and abilities. In applying this plan, the graduate engineer is given great flexibility in laying out his course. After discussion of experience, aptitudes, and preferences with an experienced advisor, a training schedule with a related sequence of jobs is projected. In progressing from one job to another the individual's ideas may change, in which case his course is modified to coincide with the new objectives.

Recently inaugurated, an Allis-Chalmers program of graduate study in cooperation with the Illinois Institute of Technology is also discussed. The program involves professional and technical education on the graduate school level, leading to a master's degree.

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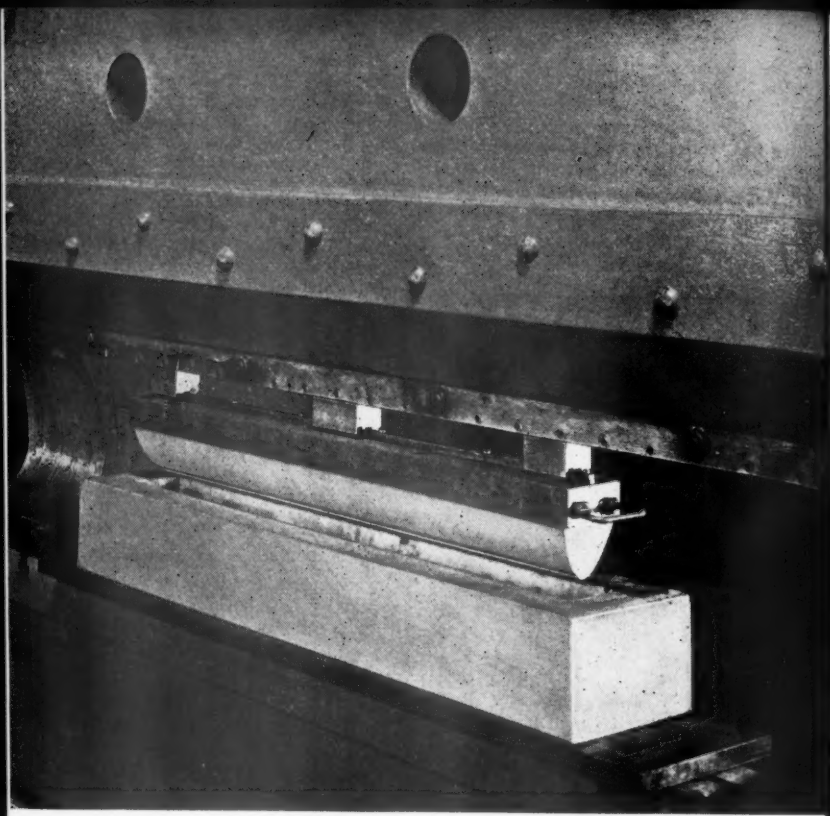


Fig. 1—Male and female sections of cast resin die for forming aluminum reflector, in place on power-operated brake, which has been found to be a successful and low-cost method of forming this reflector.

All photographs courtesy of Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.

Cast Resins Find New Uses

During the three years which have elapsed since liquid phenolic casting resins were first introduced as a forming-die material for the light metals, the versatility of the new material has gradually been recognized and many unforeseen applications have been developed. Such items as forming dies, foundry patterns, holding fixtures, masking shields for plating and painting, and drill jigs, all are now cast successfully from these resins. The photographs illustrate two recent developments in this field.

The Bennett Manufacturing Co., of Alden, New York, is forming an aluminum reflector with both male and female

sections of the die cast from a Durez phenolic resin. This is unusual, for ordinarily the resin has served only as the male section. Of equal interest is the fact that instead of the usual hydropress or stretchpress, this die is being used on a power-operated brake. When this low-cost method was first suggested, the advisability of subjecting the plastics dies to the necessary pressure per unit area was questioned by the material supplier's service engineers. Bennett, however, disregarded precedent and undertook production of the reflectors using their new method. The results have been highly satisfactory. About 2000 reflectors of 0.020 aluminum (24-gauge) have been formed on the die to date and with no appreciable wear as yet evident.

It is reported that the surfaces of the formed reflectors have a more consistent smoothness and consequently better reflecting properties than are usually obtained using forming dies of other materials. The same advantage has been gained using dies formed from casting resin in conjunction with both hydropresses and stretch presses. The only explanation advanced so far to account for this improvement in surface quality is the low coefficient of friction of the resin surface as compared with other die materials.

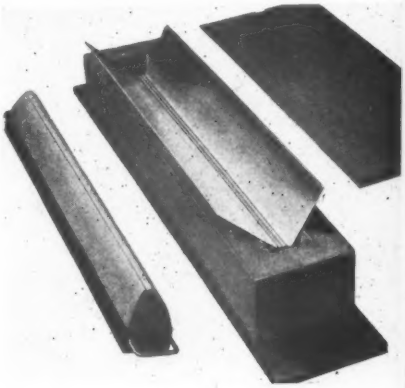
Original Cap Used as a Pattern

Another manufacturer discovered that rather than replace a lost punching die which had been used for making the spray-form caps required for separating and masking small metal parts during painting and baking, he could more economically cast the caps from a Durez phenolic resin.

One of the original caps served as a pattern. It was first coated with a wax parting agent, and, since close tolerances were not required, a chrome-plated steel plug was eye-centered in the cap and the casting resin poured around it. This assembly, after setting for a few hours at room temperature, was placed in an oven and cured for the necessary period of time—in this case about eight hours. When taken from the oven, the original cap was removed, and the mold was ready for use.

The finished caps are subjected to 350° F daily in an oven for short periods of time. No deterioration is evident after more than 1000 hours in the oven. The manufacturer reports that fewer rejects have been encountered since the plastics caps have been in service, with a resulting increase in production of the sprayed, baked parts. These masking shields have the advantages of light weight and durability. They may be easily and economically duplicated to match an increased production schedule.

Fig. 2 — Punched blank for aluminum reflector is at right of picture; scored reflector blank is positioned over female portion of cast resin die; view at left is of male die, also of cast resin.



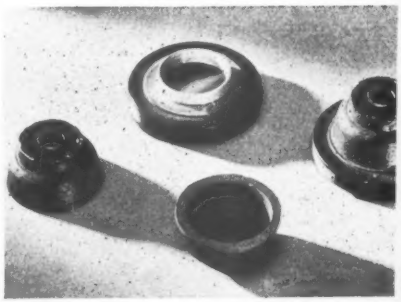


Fig. 3—Spray-form caps used for separating and masking small metal parts during painting and baking, now made from cast resin.

TIPS ON MACHINING FIBERGLAS PLASTICS WITH CARBIDE TIPS

Fig. 1 Carbide tools for turning and facing glass-reinforced plastics have rather large clearance angles. Less strength is required at the cutting edge than when turning metals. The larger clearance is desirable to keep the tool from rubbing, a condition which would speed up wear of the cutting edge due to the highly abrasive nature of the glass laminate.

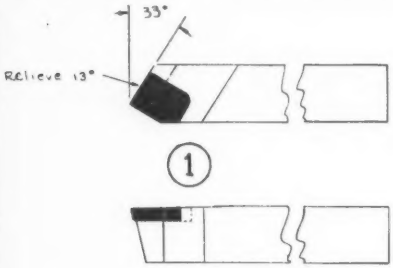
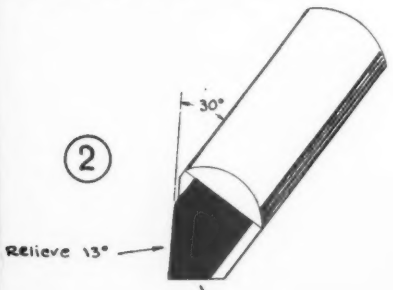


Fig. 2 Large holes can be cut in glass laminates by first drilling a starting hole and then boring to size as in metal machining practice. Note the large clearance used on this typical Carboloy boring tool for glass laminates.



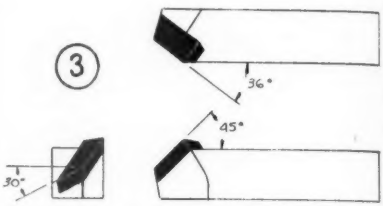


Fig. 3 Tools for both planing and shaping of Fiberglas plastics should be set so that the cut is a shearing action *backwards* and *down*, from the surface being machined, to obtain clean cuts and a smooth finish.

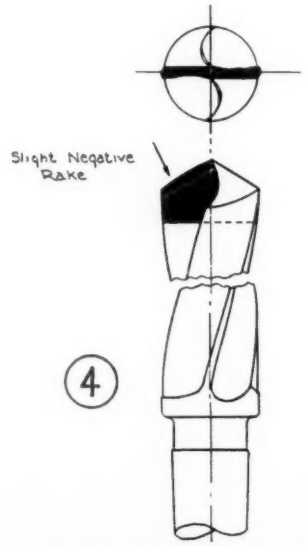


Fig. 4 Carbide tipped drills for drilling holes up to $\frac{3}{16}$" diameter in glass laminates should have a slightly negative rake ground on the cutting lip, as when drilling brass.

Fig. 5 Carbide tipped drills such as this Carboloy type, specifically designed for plastics, give best results on holes $\frac{3}{16}$" and larger. These drills have highly polished flutes and maximum chip clearance. The slow helix is for "through" holes; the fast helix is for blind holes.

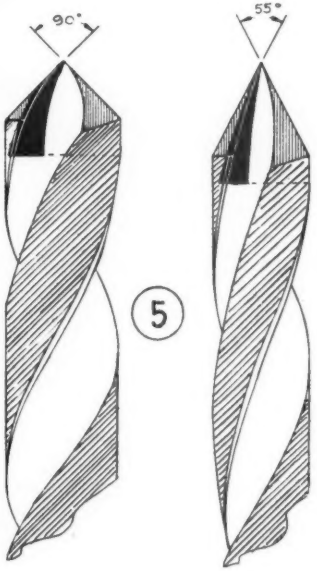


Fig. 6 Carboloy masonry type drills, which can be adapted for use in standard drill presses, can be used for drilling holes ranging in diameter from $\frac{3}{16}$" to $1\frac{1}{2}$" in glass laminates.

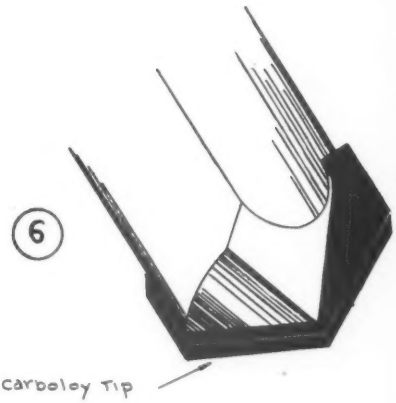
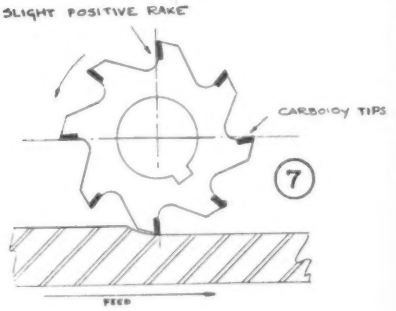


Fig. 7 Climb milling materially reduces the danger of lifting laminations at the edge of the cut and also protects the edge of the tool against excessive wear.



The superior electrical insulating properties, strength, hardness and combustion resistance possessed by the glass-reinforced plastics are resulting in their wide use both as a substitute and as an improvement in specific cases upon other more familiar insulating materials. Here is a pictorial presentation of some of the special considerations necessary when machining these materials known also as "GMG", Fiberglas plastics and glass laminates. This data represents findings from special investigations and from field reports covering actual production operations.

Compiled by Harry Crump, Sales Engineer, Carboloy Company, Inc., Detroit, Mich.

'Diecarb' Blanking and Forming Dies

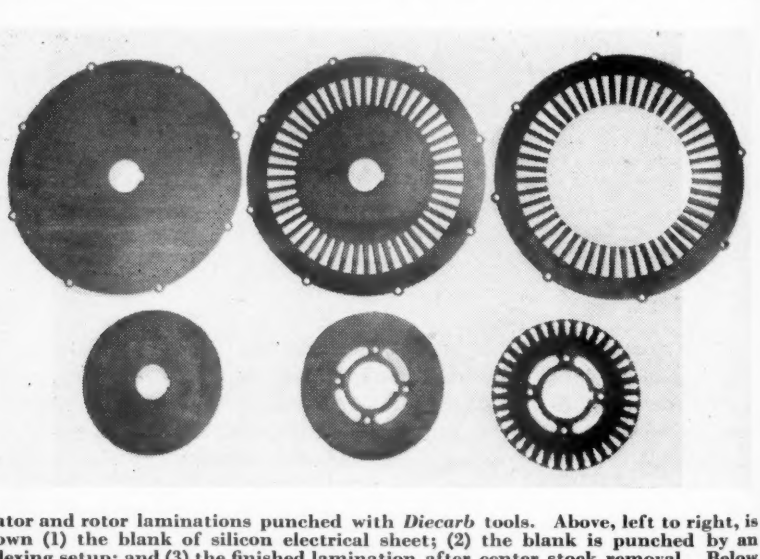
Sintered carbide blanking and forming dies that multiply by 10 to 1000 the number of pieces produced per grind; that save, in "down time" from six to eight weeks' production per year, and that are expected to lower production costs on thousands of commodities, have been announced by the Firth-Sterling Steel Company.

The dies make use of inserts of *Diecarb*, sintered carbide combinations with Rockwell hardnesses of from 65 to 73, depending upon the grade, and have been under operating tests in a diversified group of industrial plants for the past several years. Based on established performance records, the dies will figure prominently in postwar conversion plans of those industries in which high production stamping is essential.

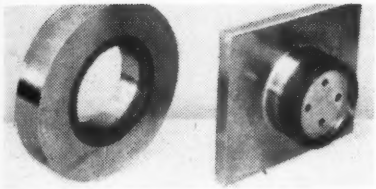
The records of these revolutionary dies give the best indication of their utility:

In one electrical manufacturing plant in Pittsburgh, a disc or "cookie" die approximately four inches in diameter started work several years ago blanking a circle of silicon electrical sheet, .025" thick as used in rotors and stators. At the latest count, this original die had completed the unprecedented total of over a half-billion stampings. Noting its success early, the company put two other similar dies into production, and they, too, are averaging between 50 and 60 million blanks per grind, as compared with 90,000 pieces per grind with high speed steel or high carbon-high chrome dies.

In another instance a plant has been making E laminations for transformers out of .025" sheet. On June 8, 1945, investigation disclosed that this *Diecarb* die had produced 1,300,000 pieces without regrinding and without the development of cutting burrs. In comparison, the previously used high carbon-high



Stator and rotor laminations punched with *Diecarb* tools. Above, left to right, is shown (1) the blank of silicon electrical sheet; (2) the blank is punched by an indexing setup; and (3) the finished lamination after center stock removal. Below is shown the rotor stock, blanked and index-notched.



***Diecarb* punching die. This is a single-slot die for punching slots in laminations.**

chrome dies had averaged between 60,000 and 70,000 pieces per grind. As far as is known, three million pieces is the record life of any type of steel die in this application, whereas the anticipated production of the die with *Diecarb* inserts is well over five million pieces per grind.

The life of a *Diecarb* die has not yet been determined for the reason that each such die manufactured is still in use or in operating condition. Even the "breakdown" point, the place where regrinding becomes necessary, of blanking dies with *Diecarb* inserts is undetermined for similar reason.

The versatility of *Diecarb* is illustrated in two other applications that have been disclosed in recent months.

One is in the plant of a manufacturer of radio tubes. This plant uses *Diecarb* inserts in blanking and forming dies that turn out a variety of parts from .005" nickel strip. One die, which blanks and forms the base of the tube, at last reports had produced 4,900,000 pieces without a regrind. The manufacturer reported that this production compared with an average of 20,000 to 30,000 pieces achieved with high carbon-high chrome steel dies.

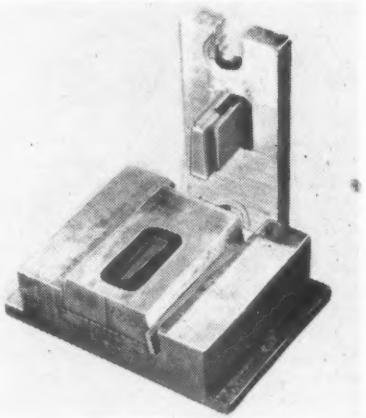
The other application, which suggests the ability of *Diecarb* to handle heavy materials as well as thin sheets, is used in the plant of a fabricator for punching $\frac{7}{16}$" armor plate with a $\frac{7}{16}$" diameter punch. The punch, at latest count, had punched more than 300,000 holes without any need for regrinding, as compared with tool-steel or other punches which frequently required redressing after punching 300 holes. The manufacturer stated that 3000 holes per grind with the steel punches was a very high average.

William C. Uecker, chief engineer of Firth-Sterling's *Diecarb* division, has compiled service records on all of the known applications of this material in industry, and states that, in addition to those dies which his company has furnished, a number of die-makers also have cooperated in experimenting with sintered carbide inserts, and that applications have been made where the stamped material includes paper as well as most of the common metals.

Diecarb high production blanking dies would have developed faster, according to Mr. Uecker, except that die-makers had to become educated in working with carbides. The problems were innumerable, he states, even though the production record of the material seemed assured and the hardness of the metal seemingly was a prime asset in a craft where tolerances of 25/millionths of an inch are frequent if not commonplace.

Firth-Sterling is prepared to supply *Diecarb* in four grades, thereby offering a complete line of carbide grades specifically designed for blanking and piercing dies. In addition, the company is embarking on an educational program to provide die-makers with engineering assistance covering design of the com-

The dark *Diecarb* inserts are readily distinguishable in this "cookie" die which is achieving a new production record each day of service. Blanking .025" silicon electrical sheet for rotor and stator laminations, it is averaging between 50,000,000 and 60,000,000 pieces per grind, and its total production is now over a half-billion pieces.



SCREW THREAD STANDARDIZATION PROGRESS

Technical men from the Army, Navy and Air Forces, as well as from the automobile, aircraft, machine tool, electrical, and other industries met in New York recently under the auspices of the American Standards Association to work on a series of standards for the threaded parts that go into aircraft engines, pipes for aircraft fuel lines, aircraft control mechanisms, instruments, and miscellaneous industrial applications.

Purpose of these meetings was primarily to consolidate the American point of view before the expected gathering of British, American and Canadian technical experts at Ottawa sometime this fall under the auspices of the combined Production and Resources Boards. It is expected that most of these American War Standards will ultimately become regular American standards.

ACME THREADS—An American War Standard has been completed. This thread is used for control mechanism of aircraft and in vises and jacks. The Canadians have adopted it and the British are considering it.

STUB ACME THREADS—An American War Standard has been drafted and sent to the Canadians and British for consideration. These threads are shallower than the regular Acme Threads.

TRUNCATED WHITWORTH THREADS—An American Standard was published in January 1945. Being revised in some details, because of war production experience. British also making revisions, so that both specifications will agree in every detail.

INSTRUMENT THREADS—The sub-committee has completed a tentative proposal for screws in sizes up to 0.060". These cover aircraft and optical instrument mounting screw threads.

HIGH-DUTY STUDS IN LIGHT ALLOYS—The war sub-committee of the ASA has developed a tentative proposal for threaded steel studs inserted into aluminum and magnesium aircraft engine castings.

BUTTRESS THREADS—The British have prepared a draft specification which includes a pressure angle of 7° and a back angle of 45°. These threads are used essentially to take up a high axial load, as in the breach mechanism of large guns and for propeller hubs.

PIPE THREADS—In an effort to bridge certain differences between American and British pipe threads for corresponding nominal sizes of 4" diameter and below, the American sub-committee has completed a proposal for an "international" pipe thread.

SCREW THREADS for COMPRESSED GAS CYLINDERS—A technical committee of the Compressed Gas Manufacturers Association has drafted a proposal, including threaded connections and cylinder valve detail.

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(CONTINUED FROM PAGE 113)

plete die; showing proved methods of applying *Diecarb* to dies by brazing, shrink-fitting, press-fitting and by mechanical matrix; and making recommendations as to grinding. To the limit of its facilities, the company temporarily will manufacture or have manufactured from existing blueprints such *Diecarb* dies as constitute original applications within an industry.

The four grades in which *Diecarb* is available for punches and dies are: (1) for paper blanking and notching; (2) for blanking carbon steel strip up to $\frac{3}{32}$" thick; (3) for blanking and punching material up to $\frac{7}{16}$" thick and with strength to withstand $\frac{3}{4}$" overhangs on punches; and (4) for blanking materials over $\frac{7}{16}$" thick where the die must absorb heavy shock.

The fundamental advantage of *Diecarb* inserts, according to Mr. Uecker, lies in the vast increase in number of blankings or formings per grind, which saves both down time and maintenance. One manufacturer stated that improved manufacturing technique, an integral part of which was the use of the new type die for both blanking and forming, has resulted in such production economies that the market price of the end product is expected to drop materially. In addition to blanking, per one grinding, more pieces than an alloy tool-steel die can punch in its entire life, *Diecarb* has demonstrated an ability to reduce burring, distortion, dimpling, buckling and chipping or breaking.

Measurements Of Temperatures In Metal Cutting

MEASUREMENTS OF THE HEAT DEVELOPED IN A METAL-CUTTING OPERATION, AS WELL AS INVESTIGATION OF CUTTING AND CHIP TEMPERATURES BY THE AUTHORS, HAVE BROUGHT OUT THAT THE CHIP TEMPERATURE IS UNIFORM AT THE HIGHER CUTTING SPEEDS WHEN ALL OTHER CONDITIONS ARE KEPT CONSTANT. THE TEMPERATURE OF THE TOOL INCREASES WITH THE CUTTING SPEED, AND THE AMOUNT OF METAL REMOVED BEFORE TOOL FAILURE WILL GENERALLY BE INVERSELY PROPORTIONAL TO THE CUTTING SPEED.

by A. O. Schmidt,[1] O. W. Boston[2] and W. W. Gilbert[3]

Review and Discussion of Previous Investigations

In a previous paper (1)[4] by the present authors, it was shown that the work done by a metal-cutting tool is transformed into heat which is carried away by the tool, workpiece, and chips. When the time of cutting is very short, the losses due to radiation, convection, and conduction are so small that they can be disregarded in most metal-cutting tests in which the calorimetric principle is applied. A comparison of the horsepower values in drilling, as computed from torque and thrust with those computed from the heat generated during cutting, showed that the calorimetric method gives results comparable to those of a well-calibrated dynamometer.

When the quantity of heat in the chips only is measured with a calorimeter (2), the average temperature increase of the chip resulting from a cutting operation can be computed by the thermal-balance method:

$(\triangle T_c)$ (chip weight) (specific heat) = $(\triangle T)$ (water equivalent of calorimeter, chips, and water)

where $\triangle T_c$ = average temperature rise of chips, deg F; and $\triangle T$ = temperature rise in calorimeter, deg F.

The foregoing formula does not take into account the change of specific heat with increasing temperatures. With the specific heat values of gamma iron, a corrected maximum average chip temperature value was computed for cutting tests in which the test bar material was SAE 1055.

Boston and Kraus (3) evaluated cutting temperatures when machining an annealed low-carbon steel in a lathe at cutting speeds between 20 and 320 fpm. A constant depth of cut of 0.150" and a constant feed of 0.030" were used. The cutting temperatures were measured with a thermocouple arrangement in which one element was the tool and the other the workpiece. These were calibrated in a furnace and the temperatures evaluated in millivolts. The tempera-

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[2] *Professor of Metal Processing, Chairman of Department, University of Michigan, Ann Arbor, Mich. Mem. ASME.*

[3] *Associate Professor, Metal Processing, University of Michigan, Ann Arbor, Mich. Mem. ASME.*

[4] *Numbers in Parentheses refer to the Bibliography.*

Contributed by the ASME Research Committees on Cutting Fluids, and on Metal Cutting Data and Bibliography of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

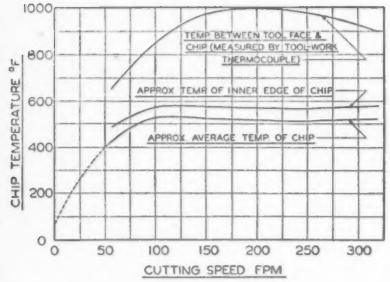


Fig. 1 — Curves of Chip Temperature Versus Cutting Speed

(From diagram by Boston and Kraus, reference 3, Fig. 12. The upper temperature line was determined by the tool-work thermocouple while the lower ones were estimated from the temper colors of the chips. Annealed 0.21C steel, depth of cut 0.150″, feed 0.030″ per revolution. The dotted line indicates average temperature values at the low speeds.)

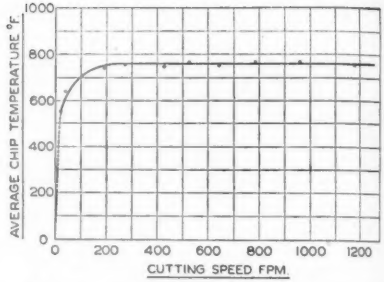


Fig. 2 — Average Chip Temperature in Relation to Cutting Speed

(These chip temperatures were measured with a calorimeter when machining 1″ diam. test bars of SAE 1055, normalized, with a face mill which had two tungsten-carbide tips of 6° negative radial rake. Depth of cut 0.125″, feed per tooth 0.008″. The dotted line indicates estimated temperature values at lower cutting speeds.)

tures obtained during cutting operations at different speeds are plotted in their paper[5] and indicate an increase in temperature from 650 to 900 F between 56 and 115 fpm cutting speed. For the cutting speeds between 115 and 320 fpm, the cutting temperatures are reported as varying between 900 and 1000 F, the maximum temperature of 1000 F being obtained at a cutting speed of 210 fpm.

Plotted on the same co-ordinates are chip temperatures determined from temper colors. Very little variation could be detected for the cutting speeds between 100 and 320 fpm, and the authors state in their conclusions: "The temperature of the chip as determined by temper colors was changed less than 5 percent in the range of cutting speed from 90 to 320 fpm."

This finding is supported by the measurements of chip temperatures with the calorimeter. The temperatures were determined as almost constant for the higher cutting speeds. This is not the case at the lower cutting speeds. Even though the work to remove the chip is the same, at a low cutting speed the workpiece and tool will conduct a higher percentage of the heat generated in the chip because of the slow separation of the chip from the workpiece.

[5]*Bibliography (3), fig. 12.*

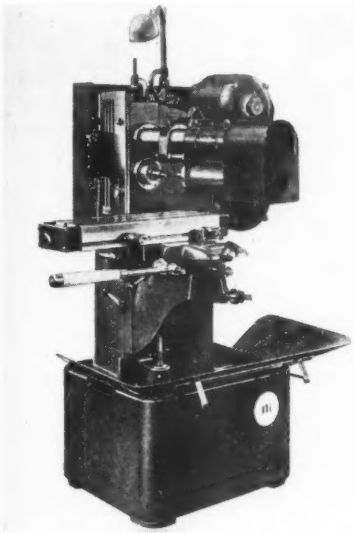
Even though work, which is transformed into heat, must be done in metal cutting, it is possible to remove metal at extremely low speeds with a relatively low temperature increase in the chip. This is because the chip is separated slowly, and the heat in the chip is given a chance to flow into the tool and workpiece. It is recognized that at the low cutting speeds less heat per unit time is generated, although a larger proportion of this smaller amount of heat generated at low speeds goes by conduction into the tool and workpiece. At higher speeds the work done is nearly proportional to the increased cutting speed, and most of the heat developed is carried away with the chip because of the short time the chip is in contact with the workpiece and tool. Assuming that the energy or work required to remove a given amount of metal is the same regardless of the time involved in removing it, it follows that for a longer period of time, that is, at low cutting speeds, the heat per unit time is less. At higher cutting speeds the time to remove the chip is reduced, and the amount of heat developed at any one instant is higher. It is therefore held that the temperature of the tool is much higher at higher speeds than at low speeds because the work

(TO PAGE 118—PLEASE)

NEW DOUBLE SPINDLE MILLING MACHINE

Coincidental with receiving their fifth Army-Navy "E" award, W. H. Nichols and Sons, Inc., announces a new line of double spindle milling machines for light production work requiring two simultaneous, medium duty cuts in metals and plastics, thereby effecting savings in setup and production time.

The machine illustrated has two opposed spindles with No. 40 Milling Machine Taper. Adjustments are provided on this model so that the spindles may



be lined up or may be set out of line vertically 2½", horizontally 2½" or in or out 1½".

Another model, not shown, can be supplied with two identical spindles, one directly over the other. A vertical adjustment is provided so that the center line of the spindles may be positioned from 4½" minimum, to 7½" maximum.

Both models have a choice of spindle drives. They are regularly supplied with two motors, one for each spindle, so that independent selection of spindle rotation is obtained. An optional drive uses a single motor which turns both spindles in the same direction.

The heavy spindles are mounted in permanently lubricated ball bearings with spindle nose hardened and ground. The work table is cast of special wear-resistant alloy, with the top ground to assure accurate location of work holders for semi-automatic production. Table operation is either by screw or rack and pinion, and employs graduated stops. All slides are pressure gun lubricated.

Every Nichols Miller is shipped with a certificate listing the actual alignment inspection figures obtained by the final inspector. These new models have all the basic features of the standard Nichols Miller.

The Nichols shop received its first "E" award in November 1942, and subsequently received renewal awards in Aug. 1943, June 1944, Dec. 1944 and just recently its fifth. These "E" awards have been given for efficient production of war material for the armed forces. Some of the products produced include highly intricate and precise pumps used on turbo-superchargers in airplane engines on B-29 Superforts, B-17 Fortresses, B-24 Liberators, and high altitude fighters, as well as hydraulic pumps for some of the Army and Navy's fastest pursuit and fighter planes, also pumps for ammunition hoists, big gun elevation, turret gun operation in tanks, and anti-icer equipment.

★

Exclusive products of the Nichols shop are rayon and nylon metering pumps. Because of wartime shortages, these pumps have been restricted to war plants which produce rayon and nylon cord, materials for parachutes and cord for producing synthetic rubber tires.

The concern, conducted by William H. Nichols, assisted by his two sons, W. Hart Nichols and Arthur A. Nichols was founded in 1902, and operate as W. H. Nichols and Sons, Inc., 46 Woerd Ave., Waltham 54, Mass. Address requests for literature to the company, care Dept. DJ.

INFORM-A-GRAM KEY No. 78-B

(CONTINUED FROM PAGE 116)
done per unit time is much greater. For this reason a tool will generally remove a greater amount of metal at low cutting speeds before failure than at high cutting speeds.

The average chip temperature measured at higher cutting speeds is more uniform because there is less chance for the heat to travel into the tool and workpiece. On the other hand, as soon as the temperature at the cutting edge corresponds to that in the chip, there would be no heat flow from the chip into the tool. The higher amount of work which is done per unit time at higher cutting speeds and the resulting greater amount of heat is also carried by a correspondingly larger weight of chips.

When the cutting speed is increased, the tool will have to do a proportionately greater amount of work. This results in a temperature increase in the tool material. The heat will not be uniform in the tool, but most intense near the point at which the cutting takes place. The zone near the cutting edge will reach the highest temperature and break down first.

When using the tool-work thermocouple, Boston and Gilbert (4) came to the conclusion that the temperatures measured may be affected by changed electrical properties of the metal in the test log which is compressed and deformed by the tool point. However, this change of electrical properties is brought about not only by the changes in the test log but also by those in the tool. Because the thermocouple was calibrated with the tool and workpiece at the same temperature, the calibration was not made under the condition which generally exists in a metal-cutting operation. During cutting, tool and workpiece temperatures will vary, and at the higher cutting speeds the temperature of the tool will be higher than that of the chip. This is a condition which can hardly be obtained during the calibration of the tool-work themocouple, and its readings in an actual test will not reveal true cutting temperatures.

Measurements of Chip Temperatures

From the investigation carried out on the calorimetric principle, it was found that the cutting force for a particular radial rake angle and chip cross section has substantially the same value at any cutting speed (5). In the foregoing tests the cutting speed was varied between 100 and 800 fpm.

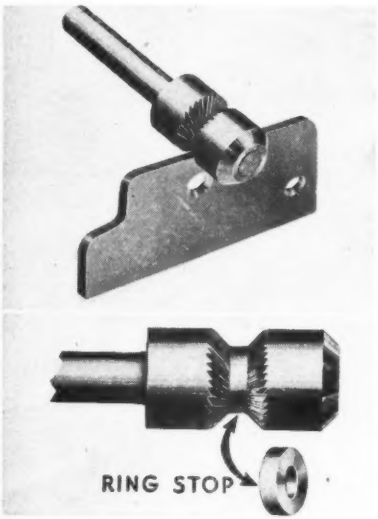
At a cutting speed of 300 fpm, the tool forces were the same as those at 600 fpm. Since the maximum volume of metal removed with any test cutter was 0.6 cu in., the cutters could be considered sharp. Therefore, any error introduced by a change in the cutting edge could be disregarded entirely. However, when cutting at 600 fpm, twice as much metal is removed per unit time as at 300 fpm and, consequently, the power required for cutting is doubled. In computing the chip temperature with the formula given, the same value was obtained for both cutting speeds. Although twice as much work was done per unit time when cutting at a speed of 600 fpm as compared with 300 fpm, the temperature of the chips remained the same because the work was done in removing twice the amount of metal. This means there is twice as much chip material to carry away twice as much heat. (The amount of heat per unit weight of chips remains constant.)

Most of the work expended in a metal-cutting operation is carried away as heat in the chips. The remainder of the heat is absorbed by the tool and workpiece.

The heat in the tool is of greatest importance because it is the accumulation and concentration of intense heat at the cutting edge of the tool which hastens failure. Comparing tool life with cutting speed, as brought out in numerous investigations (6), it is evident that the amount of metal removed before tool failure will generally be inversely proportional to the cutting speed when the chip cross section is kept constant. This happens despite the fact that the chip temperature will remain substantially the same. Assuming an ideal case in which the tool does not wear and thus change the cutting forces, the same volume of tool metal has to dissipate twice the amount of heat per unit time when the cutting speed is doubled. For this reason, a tool will break down faster at higher cutting speeds, and remove a smaller volume of metal than at a lower cutting speed. There is only a small zone including the cutting edge of the tool which will have a high heat increase

DOUBLE ANGLE DEBURRING CUTTER

The deburring of sheet metal presents a major problem in most aircraft plants. Layouts are large and make handling difficult, yet modern production setups demand speedy removal of burrs from strips and sheets needed on assembly lines. Manual methods of deburring usually are inadequate.



The Glenn L. Martin Co. recognized this fact several years ago when it submitted a sketch to Severance Tool Industries, Inc., for development of a deburring cutter which would simultaneously remove stock from two edges of strip at high speed. This cutter has since been perfected with features which permit its standardization insofar as any specially designed tool can be adapted for universal use. It is now being used by a number of large manufacturers.

The tool, a double angle deburring cutter, consists of two high speed steel midget cutting heads mounted on a one-piece arbor and separated by a spacer. When extra stock is to be removed, as in finishing or chamfering operations, the spacer is made to a width corresponding to the finished dimension. To accommodate any size spacer, cutter heads can be positioned at any place on arbor and locked by Allen set-screws.

The tool is mounted on a profile grinder or inverted drill press where manual handling of smaller and less cumbersome sheet metal is possible. In such a setup the cutter projects from the bottom through the table which can be raised or lowered to accommodate sheet metal of various thicknesses. Where deburring of larger pieces is required, the cutter is operated with a flexible shaft.

In chamfering operations, cutter diameters increase with the amount of chamfer desired. Where considerable stock is to be removed, a larger diameter cutter is recommended since it makes practical the use of fewer teeth with greater chip clearance without sacrificing cutter strength.

When only one edge of stock requires chamfering or deburring, the cutter mounted at opposite extreme of arbor is replaced with a blank angle disc which acts as a guide against the edge not to be deburred.

Cutting or guide head angles vary according to application. On ductile material the angle should be as great as possible with centerline to assure a clean shear and eliminate possibility of throwing back another burr.

Tests and experience show that the double angle deburring cutter does a cleaner job when operated at high speeds, 10,000 rpm minimum on diameters up to ¾". Chances for binding, loading and chattering are minimized at higher speeds. This is especially true on thin sheet stock which necessitates fine cuts, and when cutters less than ¾" in diameter are used.

Specifications pertaining to grind and speeds when the tool is used on various metals are available from Severance Tool Industries, Inc., Dept. J, 706 Iowa Ave., Saginaw, Michigan.

INFORM-A-GRAM KEY No. 461-B

with an increase in cutting speed. It is in this zone also that most of the friction between the chip and the tool occurs.

The temperature of the workpiece is affected mainly by its size, its heat conductivity, and specific heat. Other factors which also influence the workpiece temperature include cutting speed, cross section of chips, tool design, and wear at the cutting edge. All these must be taken into consideration.

However, if all conditions except cutting speed are kept constant, the following can be stated with regard to the chips, tool and workpiece.

1. The temperature of chips of uniform cross section remains approximately the same in the high range of cutting speeds.

2. The temperature at the cutting edge of a tool increases with the cutting speed.

3. The temperature of the workpiece is lower at the higher cutting speeds.

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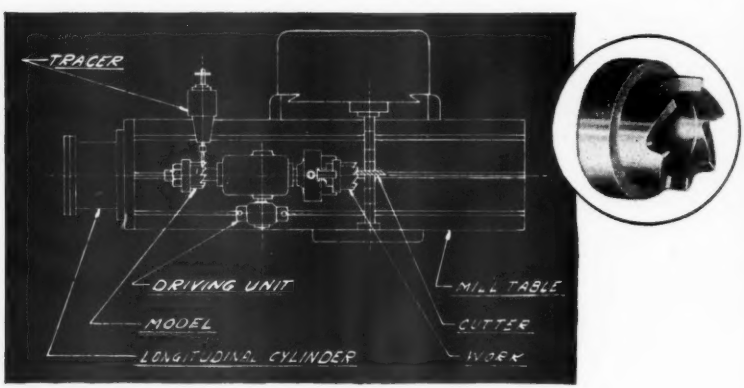


An adaptation of the Turchan Follower to an ordinary milling machine, permitting clutch teeth to be milled automatically instead of with a manually operated dividing head has recently been made by the Turchan Follower Machine Company, 8259 Livernois, Detroit 4, Mich. The arrangement is shown in the drawing here reproduced. By automatically controlling the longitudinal movement of the table while the fixture for holding the clutch blank is mounted in the dividing head, the Turchan Follower enables the cutting tool to reproduce a master model so perfectly that no handwork is needed. Besides making possible a much higher degree of accuracy than is possible by hand methods, the Turchan method also results in timesaving. For example, in the clutch shown, made of high carbon content steel, the 6 teeth 1/16" in depth and 2 1/2" in diameter, with rounded edges, were milled in 3 minutes, as compared with a machine time of 60 minutes when the work was done with a manually operated dividing head.

HYDRAULIC UNIVERSAL GRINDING MACHINES

Known as "Hydraulic Universal" a new line of Universal grinding machines is being built by Cincinnati Grinders, Inc., Dept. T, Cincinnati 9, Ohio. Sizes are 14", 16" and 18" taking 36", 48" and 72" between centers, respectively.

The table is powered hydraulically, having variable traverse rates of 3" to 220" per minute, and a stroke as short as $\frac{3}{32}$". Automatic reversal within .004" allows power grinding close to shoulders without work spoilage. Hand table traverse has two speeds, mechanically controlled, $\frac{1}{10}$" per turn of hand wheel for close adjustment and grinding shoulders; $\frac{5}{16}$" per turn for setting up. The hand cross traverse also has two speeds, .050" per turn of the hand wheel in low gear and .250" in high gear. Adjustment for repetitive multiple diameter work is attained thru graduations on the rim behind the hand wheel. Diameter reductions as small as .0001" are obtained by hand adjustment. Filmatic bearings are used for the main grinding wheel spindle. Each bearing consists of five bronze-lined heavy steel shoes. These shoes create wedge shaped oil films, and are self-adjusting for load variations. Spindle bearings are super finished to less than one micro inch. A self-adjusting plain bronze thrust bearing is located midway between the ends of the spindle. The spindle drive motor is pressure controlled, therefore operates only when the oil filled bearing compartment is under a definite pressure.

The grinding wheel spindle is V-belt driven by a 5 hp motor mounted on the wheel head. This head swivels 90° right and left.

The internal grinding quill and spindle are mounted on a hinge-type bracket at the front of the wheel head. This construction permits a quick setup by simply swinging the attachment down and tightening one bolt; thus it is always readily available but in place, never in the way. External and internal work can be ground in one setting to perfect concentricity.

The headstock "Speed Ranger" drive gives selective speeds ranging from 25 to 225 rpm by simple hand wheel control.

INFORM-A-GRAM KEY No. 233-B

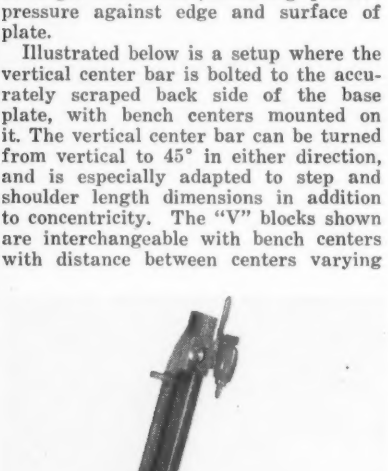
MASTER UNIVERSAL CHECKING PLATE

Master Industries, Inc., 709 E. 38th Street, Indianapolis 5, Indiana, have recently developed and are producing a Master Universal Checking Plate, with a number of detachable and adjustable checking features.

The plates are scraped to Air Corps standard, with sixteen to eighteen bearing spots psi, and indentations not more than .0002" deep. Variation from flat .001" psi or less. The plates are of three-point suspension design and do not require a special standard.

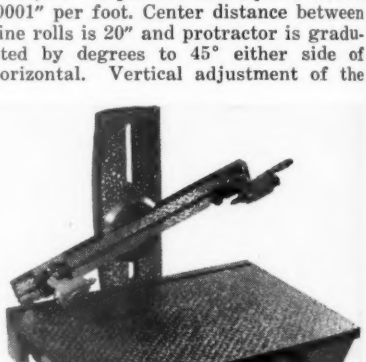
An angle groove of exclusive design is cut across the back surface of the base plate in which "V" blocks and bench centers can be located and bolted, by means of angle draw bolts, assuring positive pressure against edge and surface of plate.

Illustrated below is a setup where the vertical center bar is bolted to the accurately scraped back side of the base plate, with bench centers mounted on it. The vertical center bar can be turned from vertical to 45° in either direction, and is especially adapted to step and shoulder length dimensions in addition to concentricity. The "V" blocks shown are interchangeable with bench centers with distance between centers varying depending on size of base plate used.



Master base plates come in six standard sizes: 18" x 36", 24" x 24", 24" x 36", 30" x 36", 30" x 60" and 36" x 36".

The photograph below shows the Universal Sine Bar Unit. The riser plate is bolted over a key insert in the base plate, 90° to parallel and square within .0001" per foot. Center distance between sine rolls is 20" and protractor is graduated by degrees to 45° either side of horizontal. Vertical adjustment of the protractor is approximately 6", while centers are 4" high with a 7⅛" swing and 15" between centers.



This unit is specially adapted to cylindrical grinding, checking concentricity and variation in taper. Additional checking fixtures available are the adjustable angle plate and angle plate sine bar unit.

By attaching these various checking fixtures to the base plate the total working area on the base plate is considerably increased.

A concentricity checking unit is available, which consists of a light weight, rigid construction, tubular casting, for bench mounting. It has a machined groove similar to the bench plate to take "V" blocks or bench centers. The "V" blocks and bench centers are interchangeable on the checking plate fixtures and the concentricity checking unit.

INFORM-A-GRAM KEY No. E7-B

SCIENCE - THE ENDLESS FRONTIER

Establishment of a National Research Foundation by Congress for the purpose of promoting a national policy for scientific research and scientific education is proposed by Dr. Vannevar Bush, director of the office of Scientific Research and Development, in a report recently submitted to the White House.

The report, prepared at the request last November of President Roosevelt, recommended:

(1) That the Foundation be formed to develop scientific research, financially support basic research in non-profit organizations, encourage scientific talent in American youth by offering scholarships and fellowships and promote long range research on military matters.

(2) That the Foundation consist of nine members to be selected by the President and be responsible to him. They shall serve four years and without compensation.

(3) That the Foundation have the following five divisions: Medical Research, Natural Sciences, National Defense, Scientific Personnel and Education, and Publications and Scientific Collaboration.

In submitting the report Dr. Bush said that an adequate program for Federal financial support of basic research and scientific education, as proposed in his report, would cost about $33,000,000 at the outset and might rise gradually thereafter.

Dr. Bush urged active interest by the government in basic scientific research and development and emphasized that this would require increased support from public funds and that new impetus must be given to scientific research in this country, which can come promptly from the government and cannot be left solely to private industry. Private sources, however, should continue to carry their share of the financial burden.

Since 1900 a large number of scientific agencies have been established within the Federal government, until in 1939 they numbered more than forty. Although these agencies have showed splendid achievement, they have been limited in function. At this time there is no body within the government charged with formulating or executing a national science policy and there are no standing committees of Congress devoted to this subject.

The report disclosed that expenditures for scientific research by industry and government increased from $140,000,000 in 1930 to $309,000,000 in 1940 and that those by colleges and universities grew from $20,000,000 to $31,000,000, but expenditures by research institutes declined from $5,200,000 to $4,500,000 during the same period.

There is a deficit of trained scientific personnel in the United States of about 150,000, who, but for the war, would have received bachelor's degrees. It is estimated that the deficit of those holding advanced degrees in chemistry, engineering, geology, mathematics, physics, psychology and the biological sciences will amount to about 17,000 by 1955.

The report recommended a program to provide 24,000 undergraduate scholarships and 900 graduate fellowships, which would cost the government about $30,000,000 annually when in full operation. Each year under this program 6,000 undergraduate scholarships would be made available to high school graduates, and 300 fellowships would be extended to college graduates. Those who receive such scholarships and fellowships would constitute a National Science Reserve and would be subject to call to government service in connection with scientific or technical work in time of war or other national emergency.

Dr. Bush stressed the necessity of having the government provide suitable incentives to private industry in conducting research, and urged modification of certain provisions of both the Internal Revenue Code and the patent system, maintaining that the government should help industry in its research projects by clarifying present uncertainties in the Internal Revenue Code in regard to the deductibility of research and development expenditures as current charges against net income, and by strengthening the patent system so as to prevent abuses which reflect discredit upon a basically sound system.

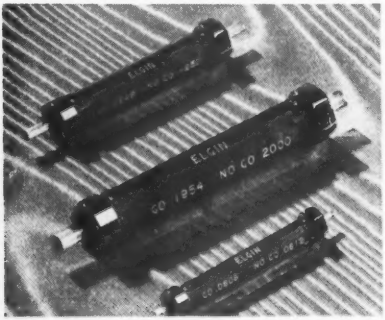
He also urged the release of war-developed scientific knowledge as soon as it is expediently possible so that much of it can be used by industry.

SAPPHIRE PLUG AND RING GAGES

Resistance to wear is the outstanding characteristic of sapphire plug and ring gages produced by the Sapphire Products Division of the Elgin National Watch Company, Aurora, Ill.

Because they give comparatively long service, Elgin Sapphire Plug and Ring Gages are an important factor in precision manufacture for interchangeability of parts on which the American production system is built.

Inherent properties of sapphire account for its superior performance when used in gaging. Next to the diamond, it is the hardest substance on the mineral



hardness scale. Because of that, sapphire plug and ring gages can be ordered in the exact size needed, with no wear allowance required.

Moreover, sapphire is not affected by any chemical ordinarily encountered in gaging practice, therefore, the detrimental factors of rust and corrosion are eliminated. Sapphire, being a strong material, stands up well under ordinary shock of handling. Since they are not subject to burring, it is impossbile to gage parts inaccurately as a result of unnoticed damage to a gage. These inherent properties of sapphire account for its excellent performance when used in gaging.

Sapphire plug gages used in one war plant show wear of 0.00001" after approximately 158,000 gagings, this being well within the tolerances, as against 300 gagings with the plugs formerly used. Likewise, ring gages, after more than 172,000 gagings, showed wear of less than .00003" over a distance of $\frac{1}{64}$".

Another war plant reports the use of sapphire plug gages on a lapped internal diameter job held to a total tolerance of 0.0001" where 2,000 gagings per day have been made over a period of several months. Gage wear has been less than .000005" and the sapphire gages have been credited with contributing at least 25% of a 100% increase in production attained in this lapping operation. Descriptive literature and specifications can be obtained by writing the company, attention Dept. T.

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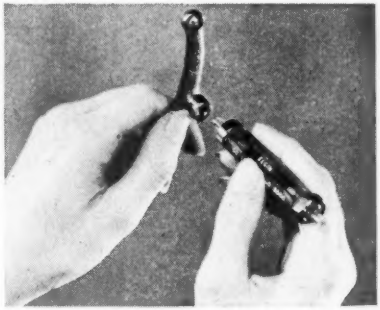

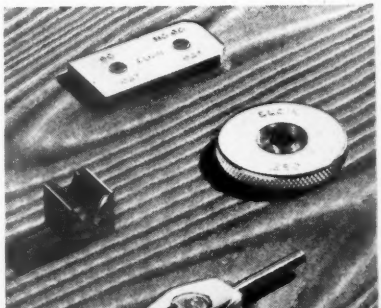

INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

Wartime Technological Developments

A study made for the Subcommittee on War Mobilization of the Committee on Military Affairs, of which Senator Harley M. Kilgore is chairman, deals with short cuts and speed-up production methods devised by industry in its effort to give our fighting men more machines and guns in the shortest time possible. There are 400 pages containing over 1400 items, compiled from technical and trade magazines, covering materials, improved operation technique, construction methods, new products and many others, all classified.

To illustrate, several items have been chosen at random. Under Machine Tools, page 167, No. 568. By equipping a small drill press with a ½ hp Thy-Mo-Trol drive, operating speeds can be so varied, according to General Electric, that materials ranging from molded components to hard steel pieces can be drill-pressed without changing pulleys. The electronic control permits speeds to be adjusted from 25 to 1750 rpm by turning a knob, and the direction of rotation can be reversed by pushing a button—Electronics, August 1943.

Plastics, page 293, item No. 1239. An easily worked, non-conducting plastic board has been developed by United States Rubber Co. to support bullet-sealing fuel cells and de-icer tanks. The material weighs half as much as aluminum, withstands gun fire, and is unaffected by changes in temperature over a wide range. National Aeronautics, November 1943.

This monograph can be secured through the Superintendent of Documents, U. S. Printing Office, Washington 25, D. C. Price fifty cents each.

New AMTEA Associates

At a recent board of directors' meeting of the AMTEA Corporation, an export sales and engineering organization serving Latin American users exclusively, four more companies were elected to associate membership. These companies are: Abrasive Machine Tool Co., manufacturers of surface grinders; Baker Brothers, Inc., manufacturers of drilling machines; Lake Erie Engineering Corp., manufacturers of hydraulic presses; and V. & O. Press Co., Inc., producers of power presses.

Companies already associated with AMTEA Corporation include: Kearney & Trecker Corporation, producers of milling machines; Landis Tool Company, producers of cylindrical grinders; Lodge & Shipley Machine Tool Co., makers of engine lathes; and Warner & Swasey Co., makers of turret lathes.

AMTEA Corporation, whose main office is located in the Empire State Building, New York City, is owned and controlled by its associate manufacturers, and is equipped to sell and service machine tool purchases for Latin American users.

Enemy Technical Reports Committee

Evaluation and distribution of technical information received from occupied countries will be the work of the Enemy Technical Reports Committee, which is now being formed, J. A. Krug, Chairman of the War Production Board, has announced.

Dr. Donald B. Keyes, director of WPB's Office of Production, Research and Development, will be chairman. Other members of the committee will be announced later.

All information on the enemy's technical advance that comes into WPB's possession will be studied and distributed by the committee, without discrimination, to individuals, industrial concerns and other recipients, for war production purposes, as follows:

1. Where military security does not permit general publication, information will be distributed on a classified basis to all persons whose possession of the knowledge would advance the war effort and who may under security regulations properly receive such classified material.

2. Where military security is not involved, and where the information is not classified, it will be distributed through publication in appropriate technical journals or through distribution of reports to all interested applicants.

Carbide Offers New Lubricant

A new internal combustion engine lubricant having unusual advantages over mineral oil, particularly for cold weather use, has been announced by Carbide and Carbon Chemicals Corporation, a unit of Union Carbide and Carbon Corporation. This lubricant, which is now being produced in commercial quantities, has properties quite different in many respects from oils derived from petroleum. The lubricant can be manufactured to any desired viscosity and is wax-free. Pour-points vary from —30 to —80 degrees F. Flash points range from 300 degrees F up. The new materials have densities approximating that of water. Carbon residue values are less than 0.01 percent, regardless of viscosity. The lubricant is characterized by low change of viscosity with change in temperature, having viscosity indices in the range of 140 to 160. Carbide's new lubricant contains no petroleum oils. Its use in internal combustion engines has been studied for several years in a large number of vehicles which have covered a total of over one and one-half million road miles. Large quantities are being used in military equipment. These new lubricants practically eliminate sludge and varnish formation in the engine. Wear of the moving parts is in line with wear experienced with ordinary mineral oils. Ease of starting in cold weather is an outstanding advantage. There are indications already that these lubricants will be widely used in internal combustion engines when they are available for other than critical military use. These compounds are manufactured in two types, water soluble and water insoluble. The latter type is used for lubricating internal combustion engines. Other applications include lubrication of refrigerating machines and all kinds of machinery operated under conditions of low temperature or where a non-sludging oil is required, and as hydraulic fluids, textile lubricants, plasticizers, in leather treating compounds, wire drawing lubricants and heat transfer liquids. Greases having unusual high- and low-temperature properties have been prepared from these lubricants. At the present time, the sale of these lubricants is restricted to war uses.

Navy Action Films

A new Navy industrial incentive motion picture, "Advance Base", is now available for showing to those engaged in war production work. Dramatized in colorful Kodachrome, this new Navy film emphasizes the tough job ahead in the Pacific and the tremendous cost in human lives, effort and equipment behind the construction of every new frontier outpost in the Pacific.

"Advance Base" is the story of the Seabees who have built their way through every major amphibious invasion since Pearl Harbor. It is an account of the hard-hitting skillful Construction Battalions who are shown landing after the first assault wave on another Pacific island; suffering heavy casualties along with the Marine Corps and the Army; building airstrips, barracks, docks and warehouses. "Advance Base",

narrated by War Correspondent Quentin Reynolds, has a running time of 22 minutes.

Other films recently produced and available for showing to those engaged in war production are the following:

"Okinawa" (11 minutes) pictures the early phases of the campaign to win this strategic island. It shows the rocket attacks, the costly burning and blasting of installations and the fury of Jap suicide plane attacks.

"Your Mistake, Tokyo" (6 minutes) portrays the tenseness of the "ready room" on board a fast carrier just before the take-off. Actual shots show our Naval Air Power bombing key Jap cities.

"The Battle Ahead" (8 minutes) brings an important and urgent message from Secretary of the Navy Forrestal and Admirals King and Nimitz on why there can be no letdown on the home front.

All of the subjects, except "Advance Base", are available in 16 and 35mm size. "Advance Base" can be obtained only in 16mm. Films are available from official Navy incentive film depositories located in or near production centers.

Union Finances

"The CIO and A F of L are staking their future in part on the turn of a coin," A. C. Croft, President of the National Foremen's Institute, has recently reported to the Institute's Advisory Board.

The CIO, he stated, is building up morale and "security" by spending its money on education and propaganda; the A F of L by soaking its funds into war bonds to assure itself financial strength in the potentially union-hostile postwar era.

"Unprecedentedly high memberships in both organizations have brought unprecedented revenues," Mr. Croft said. "For the most part the A F of L has followed its traditional policy of banking its reserves. CIO unions, on the other hand, have invested the larger part of their assets in new organizing drives, in legislative and educational campaigns.

"Consequently, a postwar depression period will supposedly find A F of L unions in a far stronger position than the CIO to survive intact. A F of L unions frequently pay unemployment benefits; very few CIO unions do."

As examples of A F of L unions with large treasuries, Mr. Croft cited the International Brotherhood of Teamsters, $15,000,000; the Hotel and Restaurant Employees, $16,000,000; International Ladies Garment Workers, $7,707,753; International Brotherhood of Electrical Workers, $7,606,000; the Bricklayers, Masons and Plasterers $8,239,821; and the relatively small International Typographical Union (150,000 members), $5,541,534.

Two independent unions, the Brotherhood of Railroad Trainmen and the Brotherhood of Locomotive Engineers, have assets of $41,000,000 and $32,000,000, respectively. Another, the United Mine Workers, which John L. Lewis is expected to return to the A F of L fold by October, has $12,000,000.

In contrast, the CIO's United Automobile Workers, the world's largest union (over 1 million members), has total assets of only $2,669,136 and its expenditures have been exceeding its income during the past three months. The other two top CIO organizations are the Amalgamated Clothing Workers with approximately $5,000,000 and the United Steelworkers with approximately $4,000,000.

Mr. Croft reported that the large discrepancies in assets and reserve funds between A F of L and CIO unions did not especially perturb the latter's leadership. "They expect to retain their membership," he stated, "by throwing all available effort and money behind legislative and educational campaigns.

"The CIO theory is that even in a period of depression and unemployment, members will stick closely to their union if it is battling all-out for a full employment program, increased unemployment compensation, extended social security and medical care, etc."

This philosophy is so deeply rooted in the CIO, he asserted, that no CIO union, alarmed as some of them are at the possibility of postwar unemployment, has decided to forego any important part of its usual activities in order to build up reserve funds.

"Privately, however," Mr. Croft told the Advisory Board, "CIO leaders will concede that if mass unemployment occurs and if unemployment compensation is not increased, the CIO will suffer relatively more than the A F of L."

Wartime Scientific and Technical Developments to be Publicized

The facilities of the Domestic Branch, of the Office of War Information, have been made available to the newly-organized Joint Board on Scientific Information Policy. This Board was created to study the problem of supplying the general public with authentic and useful information on wartime scientific developments. The basic reports of the board will include such fundamental subjects of development as radar, rockets, metallurgy, jet propulsion, aircraft design, military and public health medicine, plastics, and the wide range of scientific development during the war. The objective of the information program is to make available to the public a comprehensive description of the developments affecting human living in both war and peace.

Rocket Powder Inspection

An improved method of examining rocket powder grains using high frequency sound waves has been developed by Hercules Powder Company research engineers and will effect a saving of approximately five and one-half million dollars a year to the nation's rocket powder program in materials and an appreciable saving in manhours.

The examination of the interior of rocket powder grains for the presence of voids is one of the most important steps in the manufacture of rocket powder. Voids or air pockets in the powder grains adversely affect functioning of the rocket. The accuracy of the projectile would be affected and the rocket motor might even burst at the time it was fired thus endangering the lives of the men firing it.

Before this new inspection method was perfected, large X-ray pictures were taken of each powder grain. However, the output of rocket powder increased so rapidly that in March, 1944, it became apparent there would not be enough X-ray film produced in this country to supply the demand when production hit its peak.

Supersonic waves of very high frequency generated by a crystal connected to a specially designed electronic circuit are passed through a rocket powder grain. These grains are from five inches to five feet long.

If the grain has a flaw, a minute air space, under the surface a certain percentage of the supersonic sound waves will be deflected from a known course. This deflection is recorded on a meter which is connected to a receiving crystal.

The human ear is capable of detecting sound waves with a top frequency of 15,000 cycles. It is necessary to use sound waves with much higher frequency in the examination of rocket powder to reveal flaws.

Hercules research engineers began investigation of the possibilities of using supersonic waves in March, 1944, and after deciding the method was feasible, asked the Brush Development Company, Cleveland, Ohio, to build supersonic generating and receiving equipment. Brush was selected because of their outstanding experience in the design and manufacture of electronic equipment of this type. After joint experimentation by Hercules and Brush engineers, equipment was perfected to handle powder inspection on a production basis.

The supersonic equipment has been officially approved by the Ordnance Department of the War Department and Navy Bureau of Ordnance and is in use at Hercules-operated ordnance plants manufacturing rocket powder and will be used at other rocket powder plants when they swing into production.

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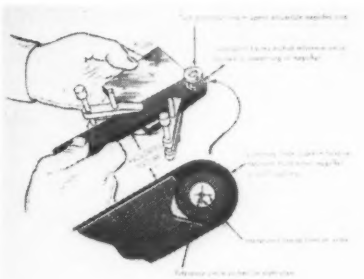
The TDJ "Buy With Confidence" directory of products, listing for ready reference the names of manufacturers and dealers, begins on page 177, this issue.

Optical Center-Locator

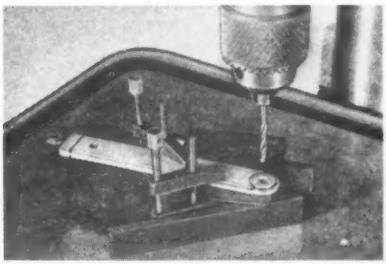
A new method for obtaining a high degree of accuracy in locating centers for drilling holes is incorporated in the Optical Center-Locator, recently introduced by Master Specialty Co., 5700 Cedar Ave., Minneapolis 7, Minn. This should be of particular interest to machinists in speeding up work on tools, dies, molds and patterns.

The set (shown above) consists of one holding fixture, one compound magnifier, center punch and sixteen drill bushings, ranging in size from $\frac{3}{64}$" to $\frac{3}{8}$", packed in a case. The compound magnifier is made up of two magnifier rings, the upper one being adjustable and supporting two powerful lenses, while a sight-glass, having an etched reference circle, is held in the lower ring. All drill bushings have the same OD as the lower ring.

After the workpiece has been carefully laid out (illustrated above) the compound magnifier is clamped into the holding fixture and it is then slowly moved over the intersecting layout lines.



Once the reference circle, which is etched on the sight-glass, is exactly centered over the layout lines, the holding fixture is clamped to the work. The magnifier is then removed from the holding fixture and the correct size drill bushing is substituted. When the drill bushing is substituted for the magnifier in the holding fixture the center of the bushing is very precisely located over the intersecting layout lines. Holes can be easily located and drilled with an accuracy of .001". The work is usually placed on parallel bars to facilitate alignment of the bushing and the drill, as shown below. Experience has shown that accurately spotted and drilled holes are obtained in fewer, simpler and more speedy operations.



The Optical Center-Locator provides an accurate means of center punching.

In addition to assisting in these and other shop procedures, the Optical Center-Locator can be used to facilitate alignment of work when it is necessary to parallel a scribed line to the stroke of a shaper. The Optical Center-Locator is of rugged construction and the drill bushings are hardened and precision ground to be concentric.

INFORM-A-GRAM KEY No. E64-B

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A second star has been added to the Army-Navy "E" Flag awarded to the Baker Brothers, Inc., Toledo, Ohio. Because of an important program on special purpose machines for the Navy, no time was taken from production hours to hold a formal ceremony in connection with the awarding of the second star. This award was made for excellence in performance in building machines to produce nozzle plates for Navy rocket shells, which requires high quality and quantity production.

High Speed Tapper

Tapping machines for highly specialized production or for tapping involving wide variations, known as Procunier Universal, have been designed and produced by Procunier Safety Chuck Co., Dept. TD, 12-14 South Clinton St., Chicago 6, Ill. These machines are available in several different models, equipped either with or without coolant facilities.

The precision built tap heads afford extremely sensitive tapping for small delicate taps at high speeds, and come in several sizes making it possible to use taps ranging from No. 2 to ¾" in aluminum and brass.

A sensitive double-cone cork-faced friction clutch engages the conical surfaces of the drive and reverse shells with a smooth "cushioned action". The tap driving power is regulated by the amount of pressure applied to the friction clutch. The clutch is kept dry, as no oil reaches the friction surfaces to impair sensitive reaction to tapping pressure, a necessary condition for high speed precision tapping. The special cork facing was developed to stand up under hard service and is practically indestructible. Bottom tapping is accomplished as readily as through tapping, since the Procunier Clutch instantly slips should the tap stick or strike bottom.

The construction of the new Tru-Grip collet type tap holder makes possible a lighter, smaller and more accurate tap holder than heretofore. The tap is driven by the square and held in true alignment by the round of the shank. Each collet is stamped for the size of tap accommodated and each set of collets is furnished in a compact container.

Many external threading jobs ordinarily performed on screw machines can be done faster and more accurately on the Procunier Universal by installing an acorn die spindle in place of the Tru-Grip tap holder.

The photograph illustrates a new machine recently added to the Procunier line which is similar to their regular machines, except that it is larger and heavier and is equipped with the "Hi-Boy" motor-driven, continuous-flow, gear-type tap lubricator. Its capacity is No. 8 to ¾" in aluminum and brass through two interchangeable tap heads.
INFORM-A-GRAM KEY No. 623-B

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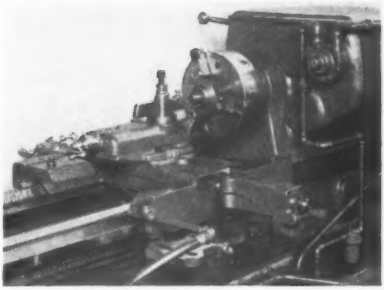
Sponge Rubber in War Work

An example of one of the many ingenious ideas which have spurred the flow of war material from United States plants, involving the use of sponge rubber, is reported by the B. F. Goodrich Company, Akron, Ohio. Employees in one plant were having difficulty picking up the small metal parts used in the assembly of their product. The assembly line traveled past them faster than they could pick up the parts—but not faster than they could work. The chief trouble was that the workers fumbled the small parts and couldn't get them off the table at the speed necessary to keep up with the production line. To slow down the line meant reduced production of a vital war article. A B. F. Goodrich engineer suggested covering the table with a thin slab of sponge rubber, which enabled the workers to get the tips of their fingers easily around the small parts and place them in the assembly. It worked, from the start, and the assembly went off the line on schedule.

Machining Aircraft Gun Turret Rings

The M32 special drilling, boring and reaming machine for producing aircraft gun turret aluminum rings is built by Moline Tool Co., Dept. DJ, Moline, Ill. M32 is one of several completely automatic machines for work on aircraft gun turret rings which has many features applicable to other machining problems presented by other kinds of metal parts. The part machined is an aluminum ring in which the M32 automatically drills and reams twenty-four groups of four small holes. At the same time it finish bores and chamfers a larger, previously drilled hole located at the center of each group. The machine has two 4-spindle drilling units and two single-spindle precision boring units. Each unit has its own hydraulic feed cylinder and feed regulating valve. Complete automatic electric control renders unnecessary skill of the operator who only needs to load and unload work and press the button to start the automatic operating cycle. In this cycle the work is indexed automatically by hydraulic power to bring each group of holes into proper relationship with the cutting tools as required. Complete safety interlocking of the electrical, mechanical and hydraulic functions prevents trouble which might occur if, for example, the reamers were fed into a part having no holes previously drilled. The M32 automatic machine, which is designed for maximum production of one particular part, saves many times its first cost during years of usefulness through reduction in unit cost of parts produced.

INFORM-A-GRAM KEY No. 400-B



Springfield Geared Head Lathe

War production has set up many demands on the Machine Tool Industry for tools and methods to perform machining operations which fall under the heading of "specials". Some developments have been special purpose machines, others have been special attachments to work on standard machines. Among the latter is a special threading job run on a Springfield Geared Head Lathe, built by the Springfield Machine Tool Company, Dept. TJ, Springfield, Ohio.

The photograph illustrates cutting a coarse thread on a lead stem which projects into a protecting flange. The problem on this job was to run the thread inside the flange to a predetermined point, which allowed no relief for clearance, also the starting point of the thread had to be held the same for each cut.

Attachments were set up on a geared head lathe which carried the thread cutting tool to the predetermined stopping point on the stem, withdrew the cutting tool, and by means of the reversing mechanism on the lathe the carriage was returned to the starting point where the cutting tool was reset, for starting a new cut, through a dog on the back side of the mechanism.

This automatic setup and operation cycle made it possible to produce these lead stems at production speeds.

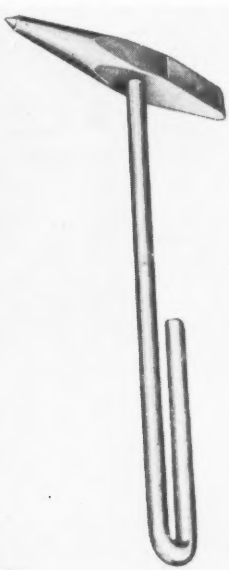
The Springfield Machine Tool Company, being one of the oldest lathe builders in the industry, has a wealth of experience to meet the demands for these special jobs.

INFORM-A-GRAM KEY No. 647-B

PROGRESS ON PARADE

Use our postage-free Inform-a-Gram for your requests.

WELDER'S CHIPPING HAMMERS. Several new models of welder's chipping hammers with steel handles are available from CHICAGO MANUFACTURING & DISTRIBUTING CO., 1928 West 46th St., Dept. TDJ, Chicago 9, Ill. The handles are made of high-grade ⅜" round steel and have a special hand grip to absorb shock when chipping and to hook on the welder's belt when not in use. Shown here is Type E which has a combination drift and chisel made for general chipping purposes. Type F is similar to Type E, except that the head has two chisels at right angles. Both types can be supplied with a removable wire brush which is fastened to the handle by special clamps and countersunk screw. These new models are manufactured in addition to well-known wooden handled CMD Chipping Hammers. Detailed information will be sent by Chicago Manufacturing & Distributing Co. *INFORM-A-GRAM KEY No. 590-B*



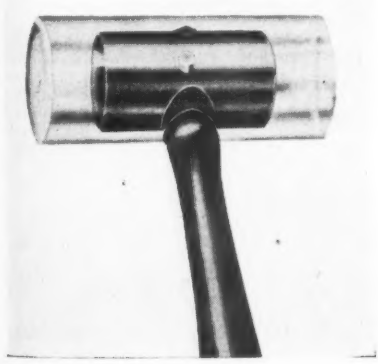
TOGGLE CLAMP. The newly improved Model KV-210 toggle-action clamp introduced by Knu-Vise, Inc., is a light duty, large capacity clamp used principally on aircraft and automotive equipment, on machinery and on furniture for clamping parts for inspecting, grinding and other mechanical processes. Its long handle gives extra leverage. Increased holding power can be achieved by reducing the length of the toggle bar for mounting close to work. The bar can be used for making direct clamping to work or it can be equipped with spindle held by a standard bolt retainer welded to the end of the bar. With the exception of the toggle bar, all parts are heat treated; the entire

clamp is cadmium plated. The KV-210 is 7⅛" high, 6⅜" long and weighs 24 ounces. The recommended load at the end of the standard toggle bar is 240 lbs. The manufacturer, KNU-VISE, INC., 133 Plum St., Dept. TD, Detroit 16, Mich., will forward additional information on request.
INFORM-A-GRAM KEY No. 649-B

TOOL BITS. The Gold-Tip precision-ground tool bits, recently announced by Tru-Cut Tool Co. of Detroit, have been designed especially for heavy cutting on scaly materials such as forgings and castings, as well as for hogging and rough cuts. These tool bits, with a Rockwell hardness of 62/64, will not chip or break and afford effective performance on intermittent operations. The standard line of Gold-Tip tool bits includes squares ranging from $\frac{3}{16}$" x $\frac{3}{16}$" x 2½" to 1¼" x 1¼" x

7"; flats range from ½" x ⅝" x 5" to 1¼" x 1½" x 8"; cut-off blades range from $\frac{3}{32}$" x ½" x 4½" to ⅜" x 1" x 6". No special grinding is required—each tool bit is ready for use. THE TRU-CUT TOOL CO., 14236 Birwood Ave., Dept. TDJ, Detroit, Mich., who also manufacture center drills, cutters, lathe mandrels and form tools, have a catalog available which contains complete information on this line of Gold-Tip tools.
INFORM-A-GRAM KEY No. 703-B

PLASTIC HAMMERS are now being manufactured by Industrial Products Suppliers of



New York for work on high polished surfaces and fine lapped finishes, on delicate parts requiring precision fit, for sheet metal work and for quick forming, without denting. This Artus Red-Hed Hammer eliminates all risk of marring metal surfaces since it has an all-plastic surface. The non-ferrous metal core is not exposed. The hickory handle is securely pinned to the head. Experience shows that the all-plastic head will last much longer than the replaceable tip variety. Literature on the Artus Red-Hed Plastic Hammer will be furnished by INDUSTRIAL PRODUCTS SUPPLIERS, 106 Water St., Dept. T, New York 5, N. Y.
INFORM-A-GRAM KEY No. 594-B

PLASTIC COLLETS FOR PLUG GAGE HANDLES. Replacing metal collets with color plastic collets is the latest improvement in the Dublife Gage, manufactured by the UNITED PRECISION PRODUCTS CO., 3524 W. Belmont Ave., Dept. TJ, Chicago 18, Ill. Green collets are for the "Go" plug; red for the "No go" plug, and since both of these are incorporated in the handle of the Dublife Reversible Plug Gage, the user can instantly spot the plug

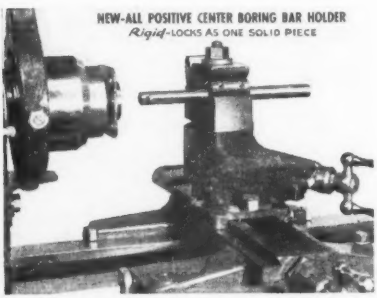
to be used. This new handle is so designed that either plug can be quickly removed without disturbing the other. Other advantages of the plastic collets are that they grip the plug much more securely, eliminate scratching and marring of the plug, and reduce the weight. Also, because the plastic collets are dielectric, they provide protection for the gage against electrical effects. Further details may be had by addressing the manufacturer.
INFORM-A-GRAM KEY No. 503-B

SUCTION TUBE ASSEMBLY Shown here is the Torit No. 64 Dust Collector with the new Suction Tube Assembly No. 88 which is manufactured by TORIT MANUFACTURING CO., Walnut and Exchange Sts., Dept. T-6, St. Paul 2, Minn. This No. 88 is an improvement over previous suction assemblies since it is equipped with adjusting nuts on the two vertical rods and one on the back rod which make it possible to place the nozzle exactly

where required. The entire assembly is counter-balanced for easy handling and it incorporates a slip-joint feature which permits raising or lowering the complete assembly. All Torit suction tube assemblies are designed primarily for surface grinders, tool and cutter grinders and other applications where it is inconvenient or impossible to fasten a dust nozzle at the dust source. They are also intended for surface grinders having an exhaust outlet on top of the wheel hoods since it is practically impossible to turn the

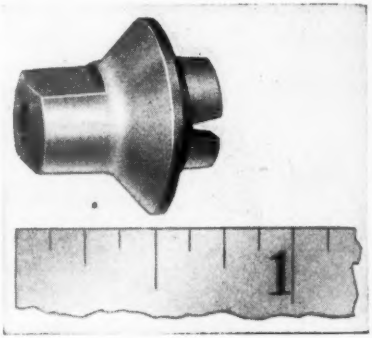
dust stream at right angles and pull dust-laden air through such an outlet. The dust nozzle of the suction tube assembly can be placed directly in the dust stream. For more information on Suction Tube Assembly No. 88 and a copy of Catalog 28 describing this company's complete line of dust collectors, write the Torit Manufacturing Co.
INFORM-A-GRAM KEY No. 494-B

A NEW BORING BAR HOLDER has been designed by Western Aircraft Tool Co. of Los Angeles which can be set at any angle on the compound, thereby allowing full use of the compound. This New-All Positive Center Boring Bar Holder is adjustable up and down on lathes 9" to 14" and 14" to 20" and handles boring or threading jobs not possible



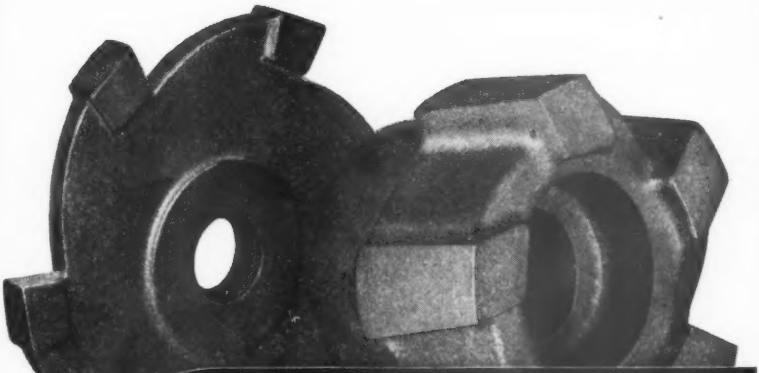
with most boring bars. The No. 1 holder has a range of 9" to 14" and handles ⅜" to ½" boring bar. The No. 2 holder has a range of 14" to 20" and handles ¾" to 1" boring bar. WESTERN AIRCRAFT TOOL CO., 650 North Hoover St., Dept. TDJ, Los Angeles, Calif., will send additional data on request.
INFORM-A-GRAM KEY No. B71-B

POWDER METALLURGY. The low-cost advantages of powder metallurgy over conventional methods have resulted in applying this method of manufacture to seals for airplane fuel pumps by the Powder Metal Parts Division of the KEYSTONE CARBON CO., Dept. TJ, St. Marys, Pa. Through compression molding of bronze powder, it was found possible to manufacture the part illustrated



here for about one-tenth the former cost of production which involved casting, machining, milling, drilling and slotting operations. In addition, closer tolerances can be maintained and production stepped up appreciably. Keystone Carbon Co. is now able to make parts of intricate design through compression molding using a wide variety of powdered metals. Write for full particulars.
INFORM-A-GRAM KEY No. 962-B

EMULSIFYING DEGREASANTS. The Gaybex Corporation of Nutley, N. J., is the manufacturer of two new emulsifying degreasing compounds. G-Bex 45-A is recommended for the cleaning and degreasing of floors, machinery, motors, equipment and parts which are being processed—prior to finishing or assembling; and G-Bex C which is especially blended to handle the degreasing and brightening of aluminum and white metal alloys. Unusual characteristics of G-Bex 45-A are that it gains strength with dilution and that it has a fresh, clean odor. Despite its powerful detergent action, this compound will not corrode metals or harm the skin; it is chemically neutral. It may be applied with a brush, spray gun, by dip; or it may



Try These New Tools at Our Expense

NOW ready is a new line of Cooper-Bessemer milling cutters, unusual in design, cast of Meehanite. They include face mills, side mills, end mills—in popular sizes.

The unique design of these cutters provides these desirable features:

1. For increased flywheel effect, the outer circumference is much heavier.

2. Tooth pads are heavier to allow amply for any positive or negative helix or rake angle desired.

In addition, these tools afford all the well-known advantages of Meehanite —easier machining, grinding and tipping; faster, more accurate cutting due to faster heat dissipation and better vibration damping; and increased tool life.

To appreciate the superior features of these new cutters, you must see and try them. We invite you to do this at our expense. Drop us a line, indicating types and sizes you can use, and we'll be glad to send you enough sample blanks for a fair trial—at no expense to you, of course.

THE Cooper-Bessemer CORPORATION

Industrial Tool Division
Dept. J, Mount Vernon, Ohio

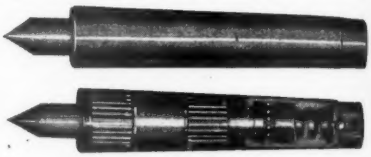
also be used in standard emulsion degreasing tanks, either cold or hot. When the dirt, oil and grease are thoroughly saturated, they are removed simply by flushing or hosing with water. A trace of the residual compound minimizes rusting after washing.

G-Bex C is prepared ready-to-use and contains no free alkalies. The Flash Point (ASTM) is 165°F and the compound may be safely handled without toxic effects; odor is slight and disappears rapidly. Parts and surfaces may be dipped in or sprayed with G-Bex C, then thoroughly rinsed with clear water. Instantly the compound dissolves grease and oil, loosens dirt and reduces oxide stains. No powder nor harmful residue remains after the water rinse. Both degreasants are available from GAYBEX CORPORATION, P. O. Box 3-C, Nutley 10, N. J.
INFORM-A-GRAM KEY No. E14-B

TOOL BLANKS. Many different types of tools can be made from the Kennametal "Universal" tool blanks, illustrated here, by setting them into recesses. These blanks, identified as Style S-000, are rectangular in shape with a 12° clearance angle formed on one long edge. They are available in all recognized standard

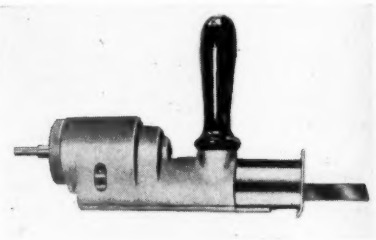
sizes, having thicknesses of $\frac{3}{16}$" or more. Many sizes are stocked in the steel-cutting grades. Catalog sheet 23-A giving complete particulars will be sent by KENNAMETAL, INC., Dept. TD, Latrobe, Pa.
INFORM-A-GRAM KEY No. 33.5-B

A SPRING LOADED CONCENTRIC LIVE CENTER with the rigidity and concentricity of the dead center is manufactured by GENERAL ALLIED METALS CO., 3835 Wilshire Blvd., Dept. TDJ, Los Angeles 5, Calif. This center is especially adaptable to absolute precision finish machining. Its design includes a heavy duty ball bearing, a heavy duty roller bearing and a heavy duty spring, eliminating wobble, chatter and work pattern. Adjustment of tail stock is not necessary; it automatically adjusts itself and has no bulky



head to get in the way, interfering with the work and causing spoilage. The accuracy of this center will not be disturbed by knurling against it. It is available in four sizes. Write General Allied Metals Co. for complete details on their spring loaded live center.
INFORM-A-GRAM KEY No. E9-B

HIGH SPEED SAW. Wyzenbeek & Staff, Inc., of Chicago, are the manufacturers of a high speed tool which can be used for sawing and filing metal, wood and plastic. It fits any ¼" electric drill, air drill or flexible shaft, and chucks in drill chuck or collet. It uses ordinary hack saw blades and standard ¼" shank machine files. All rotating parts are ball bearing run in oil, and it is equipped



with a smoothly running square plunger with take-up for wear. Wearing parts are heat treated; the saw chuck holds firmly and aligns the saw perfectly. The saw has been found particularly useful in working in difficult places. It comes complete with extra saw blade and ¼" round machine file. WYZENBEEK & STAFF, INC., 848 West Hubbard St., Dept. TD, Chicago 22, Ill., will furnish details.
INFORM-A-GRAM KEY No. 533-B

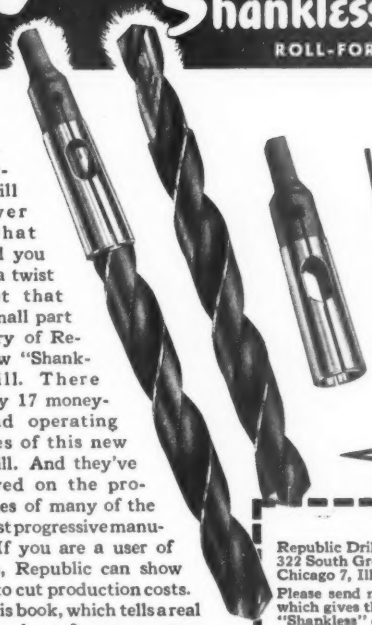
A NEW TYPE UNIVERSAL TOOL HOLDER for use on planers and shapers, as well as on lathes, has been announced by SYMMETRIC MANUFACTURING CO., Dept. TJ-7, Burbank, Calif. This holder will accommodate any size and length of ground or carbide tipped tool bits, in addition to parting, threading, facing, forming and boring tools and dial

17 ADVANTAGES

FOR YOU IN REPUBLIC'S NEW

Shankless* Drill

ROLL-FORGED



• A better, tougher, longer-lasting drill at a lower price — what more could you say about a twist drill? Yet that is only a small part of the story of Republic's new "Shankless" drill. There are actually 17 money-saving and operating advantages of this new kind of drill. And they've been proved on the production lines of many of the largest, most progressive manufacturers. If you are a user of twist drills, Republic can show you a way to cut production costs. Send for this book, which tells a real economy and performance story.

*Registered at U. S. Patent Office

THE COMPLETE STORY IN THE NEW MANUAL ... MAIL THE COUPON FOR YOUR FREE COPY

Republic Drill & Tool Co.
322 South Green St., Dept. TD 8
Chicago 7, Illinois

Please send me a copy of your new manual which gives the complete story of Republic's "Shankless" drills.

Name.....

Address.....

City.....State.....

Republic DRILL & TOOL COMPANY

CHICAGO 7, ILLINOIS

BOSTON • NEW YORK • PHILADELPHIA • PITTSBURGH • CLEVELAND • DETROIT • DAYTON • BIRMINGHAM • LOS ANGELES • SAN FRANCISCO

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TWIST DRILLS

indicators. Removal from tool post is unnecessary when adjusting for either internal or external operations. Any angle can be achieved by simply loosening the head bolt and turning to the desired position. Broad surface clamps assure maximum grip, protect tool shanks and prevent the cutting tool from working loose. The Symmetric Tool Holder is currently available in three popular sizes. The company will forward additional data on request.

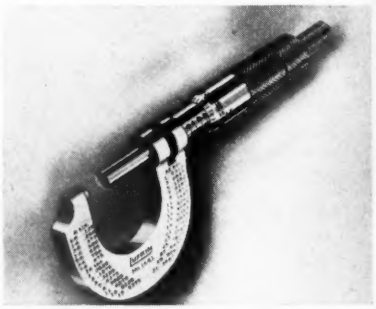
INFORM-A-GRAM KEY No. E28-B

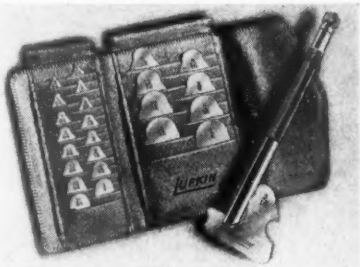
BUFFING AND POLISHING MACHINES. The new Infinitely Variable Speed Buffing and Polishing Machine announced by Standard Electrical Tool Co. has been constructed with two separate spindles; two motors; two magnetic starters; two start-stop push buttons; two hand brakes, each with coincidental switch; and two hand wheel-indicator speed controls. This machine is known as Type R2V and is available in 5 hp and 7½ hp sizes. Infinite speed range between 1500 and 3000 rpm is accomplished by merely turning a hand wheel. Since each spindle is operated individually, the operators work independent of each other. Spindle speed change permits polishing, coloring, buffing, etc., with the exact spindle speed required for each operation; also, as the wheels wear, the speed may be increased for maintaining the desired peripheral speed. The "A" dimension measuring from the side of the base to the inside of the wheel is 11", but is available to order with 7½" or 17" measurement. Standard length of spindle is 78"; height to center of spindle is 38". More information on the R2V will be sent by STANDARD ELECTRICAL TOOL CO., Dept. TJ, Mt. Hope and Sixth, Cincinnati 4, O.

INFORM-A-GRAM KEY No. 470-B

MICROMETER CALIPERS; RADIUS GAGES. Offering several exclusive convenient and time-saving features, these two precision tools are products of the LUFKIN RULE CO., Dept. TJ, Saginaw, Mich. The No. 1641 One-Inch Micrometer Calipers have a cutaway frame, making possible the taking of many hard-to-get-at measurements. They are arranged for rapid reading, with each thousandth numbered. Equipped with locknut and ratchet stop. Range: 0 to 1 inch.

INFORM-A-GRAM KEY No. 609-B





In Lufkin Radius Gage Sets, each blade (or gage) is a separate unit permitting convenient and accurate application to the work. Each blade has the corresponding external and internal form, a most practical combination. Five different sets provide a wide variety of radii in 16ths, 32nds and 64ths.

INFORM-A-GRAM KEY No. 609.5-B

Can you Complete this Shave Punch Milling Job in 60 hours?

Material Courtesy National Cash Register Company

The milling operation on this shave punch is an excellent example of the speed, economy, and accuracy obtained in a single setup with a Milwaukee 2D Rotary Head Milling Machine. Read the job report:

Shave Punch

Material—High Carbon, High Chrome Steel.

Cutting Speed — 30 fpm.

Operation Data—Mill contour as per drawing in one setup. Depth of contour 1-5/16".

Time Distribution—Setup and layout - 6 hrs.
Rough mill contour to .005" - - 25 hrs.
Finish mill to .0005" - - - - 29 hrs.
.0000"
Total Time - - - - - - - - - 60 hrs.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills intricate shapes in a single setup without the aid of templets or models — transmitting blueprint dimensions and outlines directly to the workpiece.

ACCURATE . . . chances for error are eliminated because there is no change in setup. Exact control of all combinations of cutting movements—possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and setup time are reduced to the minimum. Accurate performance of the machine saves operator's time and results in rapid production of work otherwise difficult to perform.

Write for Bulletin No. 1002C and complete information.

KEARNEY & TRECKER
Product's
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • FACE MILL GRINDER • AUTOMETRIC JIG BORER • SPEEDMILL • MIDGETMILL • CENTER SCOPE.

Boost Production & Product Quality

NOW-EXPANDED FACILITIES PERMIT

10 DAY SHIPMENT OF URGENT ORDERS

CONCENTRICITY
In low
TEN THOUSANDTHS!

Here's accuracy that automatically offsets an operator's margin of error—without additional skill or time; it cuts scrap, salvage, maintenance costs, tool costs.

Patent Pending

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Cleveland Heights 18, Ohio
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Read what Cleveland Graphite Bronze Co., leading bearing manufacturer, says about:

YOUNG PRECISION MANDRELS
"ROLLER CLUTCH EXPANSION"

"We are pleased to report that your mandrels have met your every representation. We are particularly impressed with the substantial increases in production and the excellent high accuracy resulting in improved product quality."

No More "C" Washers - Wrenches - Drawbars

1. **Uniform full-work-length friction-locking gives complete control and contact of entire bore surface area**
2. **Repeated placement of parts in uniformly exact position**
3. **Self-contained, self-expanding, self-locking — instant unloading — interchangeable sleeves**
4. **Built to your bore tolerance limits**
5. **For taper, straight shank, face plate or between-centers mountings**
6. **Any machine operation**
7. **For bore diameters .718 to 5.5**

Moderate first cost. For quotations send detailed sketches showing part in position.

Industrial In-Plant Cafeterias

In a recent survey conducted by the U. S. Department of Agriculture's Midwest Office of Supply, Chicago, one hundred of 101 industrial companies indicated their intention to continue operation of in-plant cafeterias and other feeding facilities in the postwar years, according to E. O. Pollock, director.

He pointed out that leaders of industry and labor have indorsed sound feeding practices, citing their positive influences on the health and welfare of workers, resulting in increased production efficiency, better labor relations and reduced accident rates. A continued expansion of industrial feeding is expected and a vast market in industrial cafeterias for food produced by America's farmers is anticipated.

More than 7 million manufacturing workers eat at in-plant feeding facilities today, compared with approximately 2 million before the war. The current trend is toward the permanent type of facility. About half of the factories which provide means of feeding their workers have cafeterias today. This is a decided increase over a year ago.

PUBLICATION PREVIEWS

Keep Informed!
CATALOGS
BULLETINS
SPECIFICATIONS

HILL ACME MACHINES & TOOLS are introduced in a recent publication of THE HILL ACME CO., Dept. T, 6400 Breakwater Ave., Cleveland 2, O. These products include: Hill Surface Grinders in both horizontal and vertical spindle types of open side design; Canton Alligator Shears in all sizes, right or left hand, high or low knife models; Canton Portable Cranes in 8 sizes which include 1 to 3-ton capacities; Acme XN Forging Machines which are available in 10 sizes including a range of from 1" to 5½"; Acme XL Threading Machines, Single and Double Spindle types, equipped with Acme tangent die heads and available in sizes of from 1" to 3" capacities; and Semi-Automatic Tappers in a complete line for accurately threading nuts and pipe couplings. The Hill Acme Cleveland Knife Division products are: Solid and Laid Steel Shear Blades; Rotary Slitting and Side Trimming Knives; and Metal Cutting Machine Knives. A knife sharpening service is available.
INFORM-A-GRAM KEY No. 97-B

ROCKAMARKERS, their use and construction are featured in literature which is available from ADOLPH GOTTSCHO, INC., Dept. J, 190-C Duane St., New York 13, N. Y. Time and labor are saved by the use of Rockamarkers which imprint four times faster than a stencil. Rockamarkers are all metal constructed with one handle for sizes smaller than 9" or 10" and two handles for larger sizes. The sections for imprinting may be composed of permanently mounted or interchangeable rubber dies or a combination of both. These assemblies are invaluable for imprinting dates of manufacture or packing, sizes, quantities, lot numbers and control numbers which are changeable from one group of impressions to another. For use with Rockamarkers, inks are available for permanent, waterproof impressions on wood, corrugated, fibre or metal surfaces.
INFORM-A-GRAM KEY No. 44-B

UNIVERSAL TOOL GRINDERS are the subject of a booklet published by K. O. LEE CO., Dept. J, Aberdeen, South Dakota. Included are specifications and descriptions of both standard and additional equipment and capacities of Universal Tool Grinders. This booklet's valuable feature is the clear, informative, close-up views from various angles which show work heads performing in relation to positions of the workpieces. Also presented are completely explanatory pictures of separate parts of standard equipment, extra accessories and work simplifying fixtures with their uses and measurements carefully explained. For every known tool or production grinding job, this booklet shows these Universal Tool Grinders meeting every performance requirement. The booklet may be had upon written request.
INFORM-A-GRAM KEY No. 361.5-B

THREAD MILLING CUTTERS, HS Steel or Carbide, are introduced in the circular shown here which is published by the PLAN-O-MILL CORP., Dept. D, 1511 E. Eight Mile Rd., Hazel Park, Mich. Herein are provided: tabular data on diameter; number of flutes; face width; hole size and keyway for shank and shell types of cutters. Plan-O-Mill manufactures a complete line of multiple thread milling cutters in National, Whitworth, Acme, V,

and special forms. These cutters are available either ground or unground, with straight or spiral flutes, and with or without special tooth for removing imperfect thread. They come in standard sizes for use on any thread milling machine.
INFORM-A-GRAM KEY No. 65-B

DETROIT MEDIUM DUTY TAPPING MACHINES, improved, for high production, high precision tapping with either single or multiple spindles, are described in bulletin MTM-45 issued by DETROIT TAP & TOOL CO., Dept. D, 8432 Butler St., Detroit 11, Mich. Easy-to-read line drawings and a cutaway view of the machine, with all of the parts plainly numbered, illustrate the description. Noteworthy features which contribute to the machine's exceptional precision in operation are the lead screw drive with the take-off located at the base of the lead screw for preventing lead screw "wind-up"; three rugged guide rods to control the tapping spindle throughout the entire length of its stroke; and the hand-set multiple disc friction clutch drive engaging a constant speed shaft for smooth operation and reduced tap breakage.
INFORM-A-GRAM KEY No. 134-B

VISPEED, a new, powerful air or hand-operated bench vise which can easily be converted to an automatic machine has been developed by THE BELLOWS CO., Dept. TJ, Akron, Ohio. Vispeed operates through the full range of the 6" jaw opening of the vise, positive safety control limits the air-powered movement of the movable jaws adjustable from zero to a maximum of 1". It is foot controlled leaving both hands free to handle work. Vispeed is available as a complete packaged unit, consisting of a 4" standard Reed bench vise, an 8" air cylinder, pressure regulator, gage, quick exhaust valve, air-hose and foot pedal assembly, or the air unit may be purchased separately for easy attachment to any standard 4" or 4½" vise. Literature on request.
INFORM-A-GRAM KEY No. 839-B

TWIN-FLUTED COUNTERSINKS which are recommended for cutting aluminum, magnesium, steel, plastics and plywood are described in Bulletin 451 available from the GROBET FILE CO. OF AMERICA, Dept. T, 421 Canal St., New York 13, N. Y. Besides giving a very smooth micro-inch finish they are also adaptable for coarser work such as brake linings. There are eight twin-fluted countersinks to the set, giving a full range of six sizes with duplicates in two sizes. Each Grobet sink is guaranteed against chattermarks. A perfect countersink is made with these quality tools, free from ridges or chattermarks and accurately uniform in all cases, according to the manufacturer.
INFORM-A-GRAM KEY No. 705-B

DIAMOND WHEEL COOLANT, especially prepared and compounded for use on Super-Cut Zurium Bonded diamond wheels, is explained in literature by INDUSTRIAL ABRASIVES, INC., Dept. T, 3724 West 38th St., Chicago 32, Ill. Super-Cut Coolant clings tightly to the diamond surface and forms a film which prevents hot chips from becoming embedded between the diamond teeth. Thus the wheels can clean without loading or glazing, and therefore cut free and cool. The use of Super-Cut Coolant substantially improves the finish and adds up to 25% more life to Zurium Bonded diamond wheels. Super-Cut Coolant contains no harmful ingredients, is non-irritant, non-toxic, and will not injure operator's hands or clothing. Super-Cut Coolant is sold in gallon or barrel containers, in concentrate form, which mixes with 20 parts of plain water. It is applied by pump, wick or drip feed.
INFORM-A-GRAM KEY No. 330-B

EQUITRON FIXTURES which can be used on all Rockwell hardness testers of 8" vertical capacity (size 3), or taller, are the topic of recent literature of the WILSON MECHANICAL INSTRUMENT CO., INC., Dept. D, 371 Concord Ave., New York 54, N. Y. The Equitron fixture properly supports the preferred specimen for the end quench test for hardenability of steel (generally referred to as the Jominy End Quench test). This fixture also provides for accurate positioning of the sample for each successive Rockwell hardness test at intervals of $\frac{1}{16}$", although if desired tests can be made at greater intervals.
INFORM-A-GRAM KEY No. 676-B

FORM CUTTERS & RELIEVED FORM TOOLS, fully illustrated and described in bulletin D-45, are introduced by COLONIAL TOOL CO., LTD., Dept. T, Windsor, Ontario. The involute gear cutters shown include: rack cutters; gear stocking cutters; multiple gear cutters; and metric involute gear cutters. Other cutters included are: sprocket cutters of straddle and roller chain types; spline milling cutters; pipe, thread and unground shell and shank type milling cutters; form relieved tools; and form tools of both flat and circular type. Also contained herein are instructions for sharpening form relieved cutters and all information needed to insure use of the correct tool for the required job.
INFORM-A-GRAM KEY No. C40-B

MULTIPLE SPINDLE NOTCHING MACHINE for shells, rockets, and adapters has been placed on the market by the KENT-OWENS MACHINE CO., Dept. T-7, Toledo, Ohio. The machine is equipped with a special head having three spindles, each carrying a notching cutter. These three cutters are equally

Safe from all gauging troubles, because the longer-wearing "Tantung" is especially efficient on materials which have a tendency to gall or tear, such as stainless steel, aluminum and bronze, an advantage made possible through Tantung's self-lubricating properties. More than a million Tantung tools have been sold.

WHEN YOU USE TANTUNG (THE MIRACLE METAL) GAUGES

MASTER GAUGE CO. 2218 FENKELL AVE. DETROIT 21, MICH.
Phone: University 3-7676

ELOX ELECTRICAL DISINTEGRATION

3 TIMES FASTER

Radically changed—Cuts steel three times faster than before—"Disintegration" used to remove broken tools and cut odd shaped holes for piercing and plastic dies.

3 NEW MODELS

Priced to meet the needs of small shop owners.

ELOX CORPORATION
MACCABEES BLDG. DETROIT 2, MICH.

CHARLES R. BURGESS & ASSOCIATES—NATIONAL DISTRIBUTORS

PUBLICATION PREVIEWS

spaced about the shell diameter. The shell is located in the bore at the cutting end of the fixture. The bayonet type clamp at the rear of the fixture permits easy rapid clamping and unclamping of the part. When milling notches in adapters an air-operated fixture is used for holding the part. With this arrangement all three notches are milled simultaneously giving unusually high production. Literature on request.
INFORM-A-GRAM KEY No. 345-B

NEW RUST PROOFING PROCESS, which when applied to Wendt-Sonis tools eliminates de-waxing or de-greasing before tool is inserted into tool holder or before recording tool numbers. The WENDT-SONIS CO., Dept. T-4, Hannibal, Mo., applies this film of special rust preventive compound on each tool as it leaves the factory, thus overcoming the gummy residue resulting from ordinary rust proofing methods. In addition to this protection from rust, the carbide tips on all Wendt-Sonis tools are carefully protected to prevent chipping. The use of plastic caps applied over the carbide tips makes that protection possible. Literature on request.
INFORM-A-GRAM KEY No. 518-B

BRIGHT NICKEL PLATING used as a protective and ornamental coating on many articles in widely diversified fields is featured in an 8-page illustrated leaflet published by the UDYLITE CORP., Dept. T-6, Detroit 11, Mich. Because the nickel is plated bright, buffing costs are greatly reduced or completely eliminated as are "cut-throughs" and other buffing rejects. Nickel can be plated bright on complex shapes extremely difficult to buff. Some of the products on which bright nickel has been used include automobiles, electrical appliances, plumbing goods, tools, marine hardware and miscellaneous products.
INFORM-A-GRAM KEY No. C19-B

"MERECO" IMPROVED SCREW DRIVER which employs the offset principle in its construction to exert great pressure for tightening and untightening screws has been manufactured by the MECHANICAL RESEARCH CO., Dept. T-7, 601 Failing Bldg., Portland 4, Ore. Its rotating handle works by an easy twist of the wrist giving a continuous drive to the screw. It can be used for either slotted or special screw heads—as handle cannot slip on driver in any way. Its speed makes it especially valuable for rapid work such as required on line production. Further information is available from the manufacturer.
INFORM-A-GRAM KEY No. A19-B

COIN-DIMPLING PROCESS for improved aircraft riveting is explained in an illustrated

QUICK, ACCURATE ANGLE SET-UPS

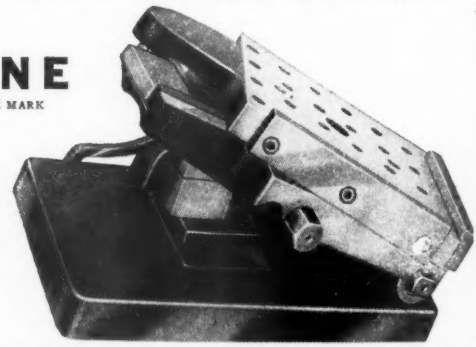
with

ROTO-SINE

TRADE MARK

New method of obtaining both single and compound angles, quickly and accurately with gage blocks. For boring, drilling, machining operations. A dependable precision tool that pays for itself in quality control and increased production.

Available in 5 inch and 10 inch models.
Table sizes—
5" Model A— 5½ x 6
10" Model B— 7 x 12
10" Model C—10½ x 12



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TRIANGLE ENGINEERING CO.

DESIGNERS OF

TOOLS • DIES • GAGES • SPECIAL MACHINES AND PRODUCT DESIGN

410 E. NINE MILE ROAD DETROIT, FERNDALE 20, MICH.

3-Point Base Insures Even Cuts

Off-balance bandsaws, caused by uneven flooring, often account for uneven cuts. Not so, however, where the Johnson Metal Cut-Off Bandsaw is used. The exclusive 3-point base provides rigid anchorage. No matter how uneven the flooring, the Johnson Bandsaw sets solid, prevents irregular cuts.

Other Important Johnson Features

1. Thinner blade reduces metal waste
2. Box type frame protects movable parts
3. Four speeds provide right speed for every metal, hard or soft
4. Hydraulic control insures even pressure throughout cut
5. Coolant attachment minimizes friction, prolongs blade life
6. Automatic shut-off after cut is completed

Write Today For Full Details

JOHNSON MANUFACTURING CORP. • 5006 Chrysler Building New York 17, N. Y.

MACHINISTS' CHOICE!

The UNBRAKO Knurled Socket Head Cap Screw

Reg. U. S. Pat. Off.

Busy men who can't afford lost time and wasted motion prefer the "Unbrako." The knurled head affords a "non-skid" grip for oily fingers, which means speedier assembly and more production. It can be screwed-in farther and faster, before a wrench is needed.

Sizes from No. 4 to 1½" in diameter. Full range of lengths.

For complete information, send for the "Unbrako" Catalog of Screw Products.

Knurling of Socket Screws originated with "Unbrako" years ago.

Standard Pressed Steel Co.
JENKINTOWN, PENNA. BOX 600

— BRANCHES —
BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • SAN FRANCISCO • ST. LOUIS

PUBLICATION PREVIEWS

folder issued by the AERO TOOL CO., Dept. T-8, 231 W. Olive St., Burbank, Calif. This process is based upon the principle of counter-compression to squeeze metal back into the dimple as it formed in the sheet. The new coin-dimpling tool has proved effective with either 24-ST or 24-SRT Dural sheets. Initial tests with harder alloys such as XB-75-ST have shown encouraging results, and complete success with all predictable aluminum alloys is a definite possibility.
INFORM-A-GRAM KEY No. 174-B

HAND & MACHINE MARKING DEVICES, designed to cover virtually all stamping and identification operations occurring in modern manufacturing plants, are featured in a new 8-page catalog issued by NEW METHOD STEEL STAMPS, INC., Dept. T, 147 Jos. Campau, Detroit 11, Mich. Included are numerous designs of type holders and type, roll marking devices, logotypes, dies and identification stamps. Among recent additions to New Method standard type holder are pilot holders for annular marking using a simple removable stamp bushing; an annular round type marker so designed that a single character can be removed from the retainer without disturbing the remainder of the type; and a roll marking holder—using interchangeable type—constructed to eliminate "type jumping".
INFORM-A-GRAM KEY No. 122-B

FLEXIBLE SHAFT MACHINERY manufactured by the B. C. LEWIS MFG. CO., INC., Dept. D, 14 Dunham Pl., Brooklyn 11, N. Y., is presented in descriptive literature available from the company. Obtainable in three different styles—bench, floor and suspended—each type is made in a four speed and single speed design. Their handpieces are of the ball bearing type and are made up for use with spring collets, drill chucks, grinding spindles and any other attachments to be used in conjunction with flexible shaft machinery.
INFORM-A-GRAM KEY No. E47-B

AIRLOX PNEUMATIC VISES in two new models which are recent additions to the Airlox Vise line are the subject of a descriptive circular by PRODUCTION DEVICES, INC., Dept. J, Whitehall, N. Y. These new Airlox Vises incorporate machined and keywayed sides as well as base so that the vise can be mounted with either side or base keyed to the machine table. Their enclosed mechanism assures long, trouble-free use and setup time is saved by the jaw which is instantly adjustable for travel of from ⅛" minimum to ½" maximum. The jaw castings can be drilled to customer's specifications.
INFORM-A-GRAM KEY No. 432-B

SHOP STORAGE UNITS, including steel frames and boxes in sets of 18, tool room shelving inserts, wire mesh partitions, work benches and machine tool tenders are described in literature issued by THE PHILLIP-EDWARDS CO., Dept. J, 117 E. 24th St., New York 10, N. Y. This necessary shop equipment for saving tools, time and labor by means of orderly storage is pictured, all measurements and construction features stated, and list prices are given herein. Additional parts which are sold separately are steel bench legs and label holders.
INFORM-A-GRAM KEY No. E50-B

CHEMICAL CLEANING, Paint Stripping and Corrosion Removal by use of labor saving methods are fully explained in Technical Data Bulletin A-326 recently prepared by TURCO PRODUCTS, INC., Dept. D, 6135 S. Central Ave., Los Angeles 1, Calif. Some of the twenty-two processes described herein are: cleaning steel before galvanizing or pickling, neutralizing pickled steel before painting, removing sand from castings, preparing aluminum and other metals for painting, and preventing corrosion of fuel and double bottom tanks.
INFORM-A-GRAM KEY No. E54-B

AIR-HARDENING TOOL STEEL SELECTOR. A special adaptation of the well-known Carpenter Matched Set Method of selecting the right steel for the job has been issued for its air-hardening tool steels by THE CARPENTER STEEL CO., Dept. 9-N, Reading, Pa. It describes how the three grades mentioned afford greater hardening safety, fewer tool making hazards and reduced costs in applications for which they are suitable. Tool room troubles caused by breakage, warpage and size change are reduced; the slow, uniform cooling of these steels virtually eliminates internal stresses; grinding, stoning, lapping, fitting and straightening operations are minimized. Furthermore, the deep hardening qualities of air-hardening tool steels permit many regrinds.
INFORM-A-GRAM KEY No. B38-B

XL HORIZONTAL BROACHING MACHINES. Fluid Power, Variable Speed models for high speed, pull type, all purpose internal and external broaching, are featured in a recent bulletin No. 20000B by THE OILGEAR CO., Dept. T, 1301 W. Bruce St., Milwaukee 4, Wis. Oilgear machines for every broaching need will be found among the nine XL sizes which are thoroughly described in this bulletin. Herein, besides machine specifications, are photos of actual prints showing details of the XL design, clear pictures of special construction features and performance of the machine. Every Oilgear XL broaching machine is a self-contained unit, installed with support troughs for easier broach handling, and with Oilgear controlled fluid power for saving time, effort, tools and power.
INFORM-A-GRAM KEY No. E44-B

Acro needle eye LAPS are available in 17 sizes

.032" up to .250"

Prevent *bell-mouthing* and speed the finishing of small holes with the best laps known to industry . . . Acro Needle Eye Laps. Choose your size requirements from description below and send your order today.

LAP SIZES AND PRICES

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The JA Featherweight is a distinct improvement over all models previously produced by Madison-Kipp — the originators of really high speed grinders

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Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

MADISON-KIPP CORPORATION
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PUBLICATION PREVIEWS

MULTI-FORM WHEEL is a Precision Thread and Form Grinder and the subject of a booklet by THE SHEFFIELD CORP., Dept. T, Dayton 1, Ohio. Herein is explained the crush dressing of Multi-Form Grinding Wheels, profiling them and their quick, accurate production of parts by either plunge or traverse grinding. These crush dressed wheels generate less heat than diamond dressed wheels do during grinding, the required profile may be produced by crusher dressing within a period of minutes, and wheel dressing cost is greatly reduced. The Sheffield 100 Series Precision Thread and Form Grinder specifications, clear photos of construction details, and lubrication method are included.
INFORM-A-GRAM KEY No. 24.5-B

AMIC PRECISION MEASURING INSTRUMENTS are featured in a booklet published by AMERICAN MEASURING INSTRUMENTS CORP., Dept. D-3, 240 W. 40th St., New York 18, N. Y. The booklet's first half is devoted to AMIC Precision Vernier Tools. Two of the Vernier Calipers that are of special interest are models made formerly in Germany and Switzerland exclusively and are now being produced in the United States for the first time. AMIC Vernier Gages are made with either English or Metric measure and can be read to 1/1000 of an inch or 1/50 mm by means of a vernier. They are designed for ease and preciseness of reading and checked against master scales by the most efficient methods known to modern technique. The latter half of the booklet features AMIC Optical and Mechanical Precision Indicating Gages. All of the AMIC Precision Measuring Instruments are carefully, strongly and accurately made.
INFORM-A-GRAM KEY No. 186-B

TORQUE THUMB SCREWS, are announced and described in a bulletin by the VLIER MFG. CO., Dept. D, 4552 Beverly Blvd., Los Angeles 4, Calif. Torque Thumb Screws replace the usual spring jack by supporting parts without danger of distorting them. These screws may be used on milling, excello, assembly, riveting and inspecting fixtures and on drill jigs. When the Torque Thumb Screw contacts and supports the part, the ratchet knob continues to turn without advancing the

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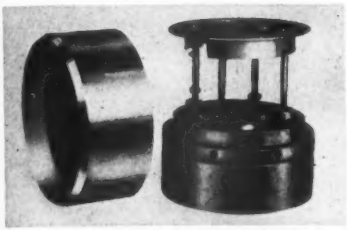

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A large sandpaper manufacturer decided that tool cost was too high and turned to tool steel tubing for the punch and die set shown above. Five of these units on a gang press stamped out 128,000 discs before regrinding, doubling existing records. Perhaps tool steel tubing will help solve *your* tooling problems.

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9" FLUTE

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	11/64"	2.15
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	15/64"	2.54
	1/4"	2.63
	17/64"	2.73
	9/32"	2.82
	19/64"	2.93
	5/16"	3.02
	21/64"	3.18
	11/32"	3.36
	23/64"	3.56
	3/8"	3.75
	25/64"	3.95
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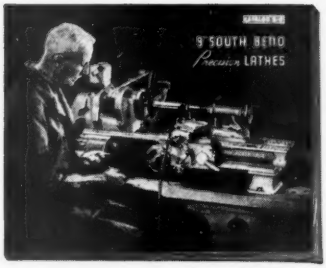
screw. The end pressure will not exceed 30 lbs. All Torque Thumb Screws are hardened and have a rust-proof finish.
INFORM-A-GRAM KEY No. E51-B

PEELABLE PLASTIC "LIQUID ENVELOPE" COATING is pictorially described in a 16-page illustrated booklet issued by BETTER FINISHES & COATINGS, INC., Dept. T-4, 168 Doremus Ave., Newark 5, N. J. This material has been used as a protective coating upon thousands of warplanes enroute overseas and is believed to have many peacetime applications, such as protecting laid-up tools or equipment; as a peelable protective-coating for finely-finished metal, wood or plastic surfaces during manufacturing operations, and as an easily-removed "plastic wrap" for shipping and warehousing.
INFORM-A-GRAM KEY No. E67-B

ENGINE, TOOLROOM & PRECISION LATHES (9-inch) are introduced in the lately published catalog 9-G of the SOUTH BEND LATHE WORKS, Dept. D, 432 E. Madison St., South Bend 22, Ind. The 9" Precision Turret Lathes have a ½" collet capacity. These models are well suited for the production of small precision parts, for exacting toolroom



work, and for general and specialized use in machine, maintenance, repair and laboratory shops for the working of all metals, plastics, and other machinable materials. Lathe tools, accessories, motors and controls, and attachments for special classes of work are herein illustrated and described in detail. This 36-page catalog 9-G will be mailed upon request.
INFORM-A-GRAM KEY No. 564-B

ILLINOIS DIE FILING MACHINES for rapid and accurate performance of critical finishing operations are featured in a bulletin by ILLINOIS TOOL WORKS, Dept. D, 2501 N. Keeler Ave., Chicago 39, Ill. These machines save time and do superior finishing of intricate die shapes. Their tables can be tilted 20 degrees to either right or left and have removable ring inserts for accommodating

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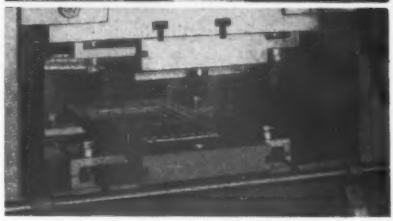

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Drawing and forming dies made from "Strenes" cuts machining time 35 to 50% because they are cast to shape, usually to 1/16". They deliver several times the usual number of stampings between redressings.

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FOR DRAWING AND FORMING DIES

PUBLICATION REVIEWS

shank sizes of saws and files of up to 6" in length. The saw guide may be utilized as a hold-down finger. A finishing stone can be easily and quickly installed. Tedious hand jobs of filing, sawing and stoning are eliminated by use of this versatile Die Filing Machine.
INFORM-A-GRAM KEY No. 830-B

HOLE PUNCHING with the Wales CD System which provides many new, time and money saving advantages, is illustrated and described in catalog CD by WALES-STRIPPIT CORP., Dept. T, 355 Payne Ave., North Tonawanda, N. Y. This system utilizes Wales CD Hole Punching Units, Templates, Locator Rings, Adjustable Stops, Feed Rails and Drill Templates. With these parts, making a perforating die is a simple assembly job. The two methods of mounting type CD Units into a multiple hole punching die, as well as their many applications in press brakes and stamping presses are fully explained.
INFORM-A-GRAM KEY No. 60-B

ENGRAVING, MARKING & ETCHING may be done with The Panto machine which is available in three models described in a folder by H. P. PREIS ENGRAVING MACHINE CO., Dept. T, 155 Summit St., Newark, N. J. Model UE is designed for rotary engraving on metals, plastics, wood, etc. Model UEM is an electrical marker for objects which have surfaces too hard for engraving or stamping. Model UAM Acid Etcher serves for very fine and necessarily accurate markings. Interchangeable heads may be used on all three models, and additional equipment is available.
INFORM-A-GRAM KEY No. D58-B

DELTA MILWAUKEE TOOLING TIPS are presented in a recent folder published by THE DELTA MFG. CO., Dept. J, 600 E. Vienna Ave., Milwaukee 1, Wis. Besides introducing a new coolant pan attachment for Delta Cut-Off Machines, this folder contains interesting photos and descriptions of time and cost saving installations of Delta Machine Tools. Delta Tooling Tips, The Delta Industrial Catalog for convenient ordering, The Blue Book showing how to save time and money with machines built from standard Delta units, and ASTE Data Sheets giving complete dimensions and specifications of Delta Milwaukee Machine Tools are available upon request.
INFORM-A-GRAM KEY No. 51-B

NOBUR TOOL—A burr-removing tool that removes all burrs and sharp edges around the inside of holes, of either single or multi-walled parts has been manufactured by the

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By eliminating complicated pulley arrangements and costly lineshaft maintenance, Masterdrives power surface grinders for maximum efficiency and economy.

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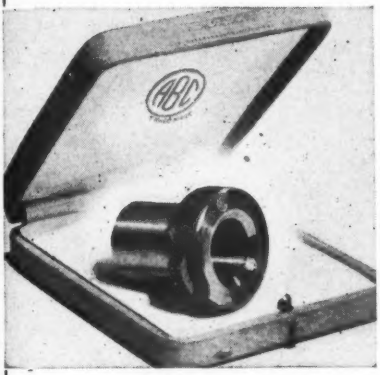

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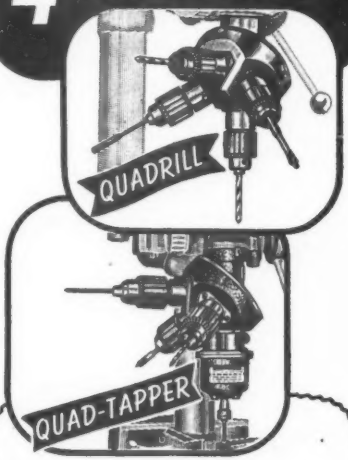

★ Your drill presses should be equipped with the QUADRILL 4-position turret attachment. It actually converts a single drill press into FOUR. More than that, it permits hi-speed tapping operations when the self-reversing QUAD-TAPPER (designed only for use with the Quadrill), is attached. The Quadrill and Quad-Tapper combine to form one of the greatest production tools presented to industry in years. In fact... the "blue book" of industry is already heavily represented among our many users.

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PUBLICATION PREVIEWS

NOBUR MFG. CO., Dept. T-5, 910 N. Orange St., Los Angeles, Calif. It can be placed in the spindle of any machine tool and safely operated by any worker. An engraved black line around the circumference of the shaft increases the efficiency, ease and speed with which each tool can be used. Placed around the shaft at a point indicating the center of the cutting blade, this black line provides a good clear marking for the position of the workpiece when burring.
INFORM-A-GRAM KEY No. 164-B

ASA DRILL BUSHINGS are explained in a Data Folder by PRODUCTS ENGINEERING CO.; Dept. D, 9045 Wilshire Blvd., Beverly Hills, Calif. These PEC Drill Bushings are useful for all precision drilling machines, they conform rigidly with all A.S.A. requirements (all bushings standards A.S.A. Rockwell 60-65) and are carried in stock for immediate delivery. This Data Folder explains how to use correctly sized bushings for standard sized drills in easily understandable charts of sizes, dimensions and list prices. It is available upon request.
INFORM-A-GRAM KEY No. 158-B

TOOL STEEL GRADES are listed in a new 127-page catalog issued by Columbia Tool Steel Co. This catalog contains detailed information on compositions, hardening characteristics, physical properties and treatments, cross indexed by applications, composition and product types. The catalog is available for limited distribution to interested users. Requests should be stated on company letterheads addressed to COLUMBIA TOOL STEEL CO., Dept. T-5, 412 E. 14 St., Chicago Heights, Ill.
INFORM-A-GRAM KEY No. E39-B

HIGH SPEED PRODUCTION TOOLS are described and pictured in a catalog by ZAGAR TOOL, INC., Dept. D, 23880 Lakeland Blvd., Cleveland 17, Ohio. The Zagar Tools featured are: holding, indexing and vertical-horizontal fixtures; air-operated tools; speed chucks, collets, collet pads and internal collets; a broaching machine, broach holders and drill heads. This catalog is compiled as a complete reference manual including helpful data and specifications for engineers, tool designers and machine operators.
INFORM-A-GRAM KEY No. 650-B

OPEN END V-BELTING is discussed in Catalog Section 2186 recently published by the B. F. GOODRICH CO., Dept. T-5, Akron, Ohio. It points out that Open End V-belting helps insure efficiency and economy on many drives where use of endless V-belts is not

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4 INCH BAR HORIZONTAL BORING, DRILLING & MILLING MACHINE

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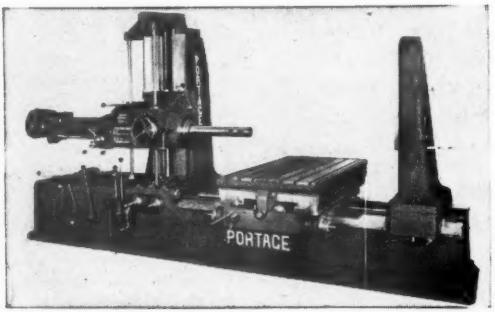

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without a single rejection, thanks to MICRO-CHEK"

- says LUCAS SCREW PRODUCTS, Inc.

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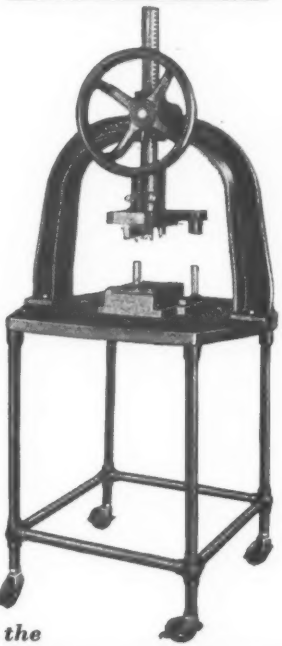

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LACEY DIE-SET MACHINE

Here is a truly "one-man" press that operates with one hand and under full manual and visual control.

Handy for tool and press rooms, it permits the diemaker to complete a die-set *right at his bench* . . . saves toolroom and handling costs.

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The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

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PUBLICATION REVIEWS

practical. Line shaft and other similar drives can be utilized by using this type belting and fasteners. Rules for successful application of this belting are given, including the method to determine pitch length, allowances for fastener length and for tension. Limitations of this type installation are outlined, and the fasteners described.
INFORM-A-GRAM KEY No. A4-B

ARBOR PRESSES—hydraulic and hand operated—are pictorially described in Catalog 39 published by the GREENERD ARBOR PRESS CO., Dept. J. Nashua, N. H. These presses are available in 65 sizes and styles ranging from 500 pounds to 30 tons pressure. The No. H-58 Greenerd Hydraulic Press is designed for work that requires a very rugged frame with the minimum amount of deflection. The frame is cast of alloy hydraulic semi-steel, and the 5" diameter cylinder is honed to size.
INFORM-A-GRAM KEY No. 616-B

REX TABLE TOP CHAIN BELT—This new flat-top conveyor chain is pictured and described in Bulletin 461 published by the CHAIN BELT CO., Dept. T-7, 1600 W. Bruce St., Milwaukee 4, Wis. It shows the outstanding points in construction and describes details which make this type chain different than others. The chain has wide application in food handling and bottling or capping processes. Manufacturers of small parts will also find this leaflet interesting.
INFORM-A-GRAM KEY No. 815-B

DENTAL LATHES are described and illustrated in a 4-page bulletin published by the RITTER CO., INC., Dept. T-6, Rochester 3, N. Y. The Ritter Model "C" Lathe is streamlined in design and is practically noiseless due to the dynamic balancing of the rotor which has been accurately tested for concentricity while rotating at high speed. The shaft is of generous size and the finished diameter is held within limits of three ten-thousandths of an inch. It is so placed that the work bench, on which the lathe is placed, forms a convenient rest for the hands.
INFORM-A-GRAM KEY No. E23-B

VIBRATION CONTROL for drop hammers, punch presses and other impact machinery through the use of Korfund vibration isolating equipment is the subject of a new 12-page bulletin recently published by the KORFUND CO., INC., Dept. TD, 48-15 Thirty-second Pl., Long Island City 1, N. Y. Unchecked vibration from this type of heavy

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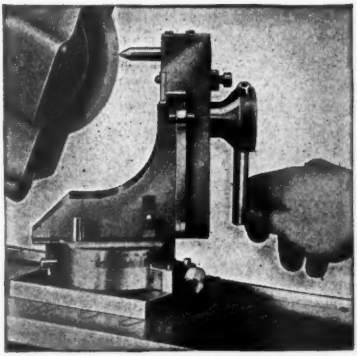
The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.



FEATURES

Fluid-motion dressing
.0001" accuracy
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Large range yet compact
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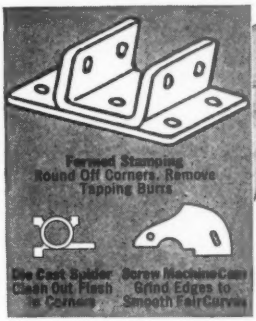
New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time"—install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.



For METAL - PLASTIC - WOOD

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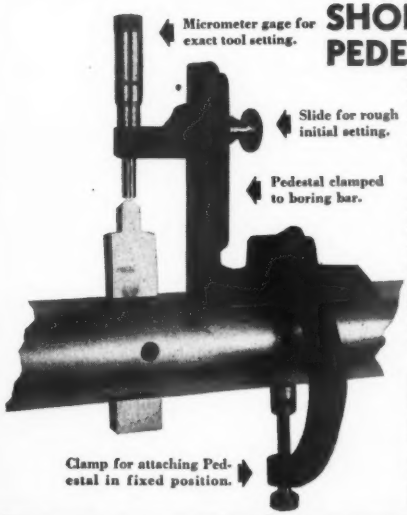
Micrometer gage for exact tool setting.
Slide for rough initial setting.
Pedestal clamped to boring bar.
Clamp for attaching Pedestal in fixed position.

SHORTEN SET-UPS WITH PEDESTAL MICROMETER

Model "AM" Bartelt Pedestal Micrometer (shown) is designed for setting tools in boring bars. Conventional cut-and-try method is unnecessary as *tool can be brought to exact position in only one setting.* Speed and accuracy of adjustment reduces set-up time and helps importantly to increase production. Bartelt gages, available in six models, are valuable and practical shop equipment for tool adjusting, work positioning, inspection, checking, and many other gaging operations. *Write for descriptive circulars today showing six models now available for various kinds of work.*

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ENGINEERING COMPANY
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PUBLICATION REVIEWS

machinery can crack firebrick and loosen refractory linings in nearby furnaces, weaken building walls and ceilings, destroy the accuracy of adjacent precision machinery, impair the health and efficiency of workers, and shorten the useful life of the impact machine itself. Photographs and drawings show how these costly effects can be permanently eliminated by mounting the machines on steel spring isolators.
INFORM-A-GRAM KEY No. E16-B

ANGLE HEAD ATTACHMENTS, to work at 90° or right angles when attached to the spindle of any vertical milling machine, jig borer, radial drill or drill press is pictorially described in Catalog No. 44 published by INVINCIBLE TOOL COMPANY, 6020 Empire Building, Pittsburgh 22, Pa.

End facing, boring, grooving or undercutting, milling slots for inserts, spot facing and numerous other operations can be done in one setting or operation which eliminates the chances of spoiling a job from resetting.
INFORM-A-GRAM KEY No. 979-B

"FOCUS ON FEDERAL SCREW" is the title of a 24-page pictorial book of particular interest to designers and production men announced by FEDERAL SCREW WORKS, Dept. T, 3401 Martin Ave., Detroit 10, Mich. The book shows at a glance just what this company can do in the contract manufacture of screw machine products and cold-forged parts to customers' specifications. Representative shop views indicate the complete and extensive manufacturing facilities at hand; and the latter half of the book clearly illustrates and describes numerous typical parts produced, involving all screw machine and secondary operations, heat treating, plating, cold upsetting and thread rolling.
INFORM-A-GRAM KEY No. E11-B

TAPS & DIES are featured in an informative 144-page Catalog, No. 19, released by the WINTER BROTHERS CO., Dept. TDJ, Wrentham, Mass. Useful information on taps and tapping includes a discussion of modern taps in practical use and suggestions for tapping steel, aluminum, plastics, long holes and cast iron. Diagrams and specifications of adjustable round split dies, crown, solid square bolt and hexagon rethreading dies are presented.
INFORM-A-GRAM KEY No. 530-B

"TAPS FOR HIGH PRODUCTION" is the title of a conveniently arranged new catalog of Hy-Pro Taps offered to the trade by HY-PRO

New "AD-LIFE" TREATMENT

(ANOTHER ACHIEVEMENT OF PERFECTION TOOL & METAL HEAT TREATING CO.)

Why not decide to get more and better work out of tools to meet keen competition?

Take advantage of treatments available here which often improve tools 30% to 60% or more. We have specialized in tool treating for a quarter-century. The war has brought new and better methods for original hardening, and also for supplementary treatings of tools purchased in hardened, finished condition.

Now is the time to investigate. Let us show you how other manufacturers have already benefited. More than half of the tools now in common use can be treated so they will run longer between grinds, hold size better, and produce a smoother finish.

Our "SILVER FINISH" is bright, clean hardening. Our "NUSITE" means harder, tougher cutting tools. Our "AD-LIFE" improves the tools you buy outside.

Write for booklet, "FIFTY FACTS." It tells what other manufacturers did to improve tool quality and life.

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TOOL & METAL HEAT TREATING CO.
1740-58 WEST HUBBARD STREET CHICAGO 22 ILL

When you're in a TIGHT spot . . . specify *Mac-its*

Mac-it alloy steel hollow set screws are milled from the solid bar, with die-cut threads. Hex sockets are generated by a special process insuring full-depth accuracy. Heat-treated for maximum strength and to prevent rounding out or splitting of the socket or upsetting of the point.

Mac-it products include Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.

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INVENTIVENESS CRAFTSMANSHIP and EXPERIENCE

in designing and building special machines and parts

● "That man is most original," said a famous philosopher, "who can adapt from the greatest number of sources."

Operating on this principle, MERZ has not limited the scope of its work to a few standardized items, but serves many industries, designing and manufacturing all types of experimental and "pilot model" equipment, special parts, tools, gages and fixtures of most intricate and complicated designs. Tell us what you need, and get our suggestions.

MERZ standard plug and ring gages,

of guaranteed accuracy, and in most wanted sizes, are carried in stock for prompt shipment. Literature mailed on request.

MERZ *Engineering Company*

INDIANAPOLIS 7, INDIANA

PUBLICATION PREVIEWS

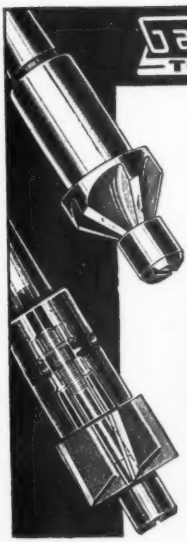
TOOL COMPANY, 461 Mt. Pleasant Street, Dept. T, New Bedford, Mass. The makeup of the book is unusual. In the first section are listed the sizes and kinds of standard taps manufactured by Hy-Pro. Each style of tap is illustrated on a left-hand page with description, list prices and discounts, and dimensions. On the facing right-hand page appear the thread limits for that style of tap. Thus, all the information about a given kind of tap appears conveniently on a two-page spread. The second section of the book gives engineering data in threading. Complete information on how to order special taps is also included.
INFORM-A-GRAM KEY No. B41-B

MAX-EL MACHINERY STEELS are featured in a folder issued by the CRUCIBLE STEEL COMPANY OF AMERICA, Dept. T-5, 405 Lexington Ave., New York 17, N. Y. Handy data and stock information on the various types of their machinery steels are presented. Max-El 1-B, the ideal carburizing steel, machines excellently on all operations, and is particularly well adapted for automatic screw machines, using either hot-rolled or cold-drawn bars.
INFORM-A-GRAM KEY No. 256-B

HEAT TREATING BATHS are featured in a descriptive booklet issued by the HEATBATH CORP., Dept. D, Springfield, Mass. Pen-Kay is a scientifically proportioned bath carburizer that will produce a high carbon case to any desired depth in the shortest possible time. The case produced is "glass-hard" with a .90-1.20 carbon content. This company has also pioneered and perfected the modern methods of black finishing for iron and steel. Their Pentrate Low Temperature Process imparts a rich deep black appearance that has substantial durability and rust resistance. PX is a new method for blackening stainless steel, stainless iron, cast and malleable irons.
INFORM-A-GRAM KEY No. 724-B

ELECTRIC SOLDERING TOOLS for new higher melting point solders are pictorially described in a pamphlet issued by the IDEAL COMMUTATOR DRESSER CO., Dept. T, 1292 Park Ave., Sycamore, Ill. "Thermo-Grips" operate on a resistance heating principal. Touching the work completes the secondary power unit circuit and causes the part touched to heat almost instantly. "Thermo-Grips" draw current only when actually in use and

GIBSON-SPRINGS
Outstanding for Quality
CORRECT design—exactly the right materials—rapid production to close tolerances—thorough testing by most modern devices—every step guided by the "know how" gained through 75 years' quality spring making experience—nothing less can produce GIBSON quality in mechanical springs. Nothing less should be good enough for you. May we quote on your requirements?
THE WILLIAM D. GIBSON CO. 1800 CLYBOURN AVE., CHICAGO 14, ILL.
(DIVISION OF ASSOCIATED SPRING CORPORATION)



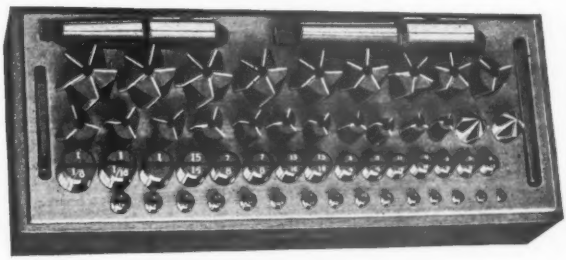
Gairing TOOLS

Counterbore Sets

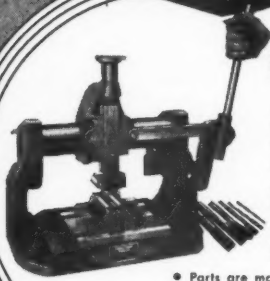
A kit of these efficient tools eliminates costly delays in counterboring and spotfacing. Seven sets from which to choose. Each contains a logical selection of interchangeable counterbores, pilots and holders. *Write for prices and Bulletin C.*

Set C-13, below, consists of 2 holders, 20 cutters ranging from 9/16" to 1¾" and 28 pilots ranging from 9/32" to 1⅛". Two countersinks, ⅞" x 70° and ⅞" x 82° are included, all neatly boxed with hard wood cover.

THE GAIRING TOOL CO., Detroit, 32 Michigan



For clear, accurate and fast marking of unhardened steel, brass and other parts, etc.



ACROMARK No. 9A MARKING MACHINES

A stronger, more durable machine for industry, the ACROMARK No 9A model speeds-up production and assembly because it is designed to operate efficiently and dependably . . . with only a minimum of adjustments. Shaft and bearing bar are heavy cold drawn steel, head gibs and adjustable slide and screw are tool steel.

With these features

- Parts are marked with lever stroke in either direction.
- Holders for straight line or roll marking are quickly interchanged.
- Simplicity of operation permits perfect results with unskilled personnel.
- Precision adjustment for any desired marking depth.

Write for literature

THE ACROMARK CO.

5-15 MORRELL STREET, ELIZABETH 4, NEW JERSEY

PUBLICATION PREVIEWS

when in direct contact with the object to be heated—and then only a very small amount, about the same as a 1,000 watt electric iron.
INFORM-A-GRAM KEY No. 329-B

MISKELLA TUB OVEN, primarily designed for the small shop or occasional user as an accessory to a spray booth when no conveyer is available, is described in a leaflet issued by INFRA-RED ENGINEERS & DESIGNERS, Dept. T-J, 1633 E 40th St., Cleveland 3, Ohio. "TUB" is the first infra-red appliance to be offered for processing work that is not moving while being baked. A portable floor stand with utility shelf underneath can be furnished. "TUB" may be suspended from a crane or a counterbalance to process work setting in a fixed location, such as a foundry ladle.
INFORM-A-GRAM KEY No. 334-B

HEAVY-DUTY VERTICAL-CUTTING SAW available for the vertical cutting of huge slabs of hard tool stock is featured in Bulletin 53 issued by the PEERLESS MACHINE CO., Dept. T, 1600 Junction Ave., Racine, Wis. Its full hydraulic control, vertical blade travel, three-speed transmission, balancing cylinder, elevating stock rollers, chip clearance, anti-friction bearings and automatic trip gauge are described. Pieces as long as 24" and any thickness up to 10" can be cut without turning the work. The capacity with standard vise jaws is 16" x 16".
INFORM-A-GRAM KEY No. 680-B

VIBRAFLEX ENGINE MOUNTINGS are featured in Bulletin BU-23 available from BUSHINGS, INC., Dept. J, 3442 W. Eleven Mile Rd., Berkley, Mich. The bulletin contains a simplified formula for calculating the proper mounting for any given load, as well as dimensioned drawings of four typical mountings capable of handling loads of from 20 to 600 pounds
INFORM-A-GRAM KEY No. 222-B

INDUSTRIAL CLEANING and allied process equipment is presented in Bulletin No. 4E1 recently published by the OPTIMUS EQUIPMENT CO., Dept. T, 165 Church St., Matawan, N. J., manufacturers of washing, rinsing, pickling, and drying equipment for metal parts. This bulletin describes their complete manufacturing and engineering services covering units from the smallest portable type to complete automatic equipment including an entire series of metal cleaning and allied process operations.
INFORM-A-GRAM KEY No. D99-B

Rawhide

The best "soft" hammers and mallets are rawhide — tough, resilient, long-lasting C/R mechanical rawhide. They strike effective blows without battering or marring . . . without fatiguing re-coil. They hold their true striking surfaces. Sizes and weights for every need. Hammers are malleable iron with replaceable C/R Rawhide insert faces.

Write for Catalog Sheets.

CHICAGO Rawhide MFG. CO.
1200 ELSTON AVE. ★ CHICAGO, ILLINOIS

"Our Tool Makers Still Talk Enthusiastically about Our GEMCO Shaper!"

A well-known mfr. of Circuit Breakers writes us: "We have had our GEMCO Shaper about a year, and our tool makers are still talking enthusiastically about it."

The Universal Type of GEMCO Shaper, shown at right, is ideal for tool and die work, or where angular work set-ups are required. Its time-tested features are:

1—Sturdy, powerful construction; 2—Utmost precision in workmanship and performance; 3—Dependability under continued severe service; 4—Ease and convenience in operation; 5—Advanced type of force feed lubrication; 6—"LUBRIGARD" Safety Device increases the Precision Life.

Write Today for Bulletin GC-12 D

GENERAL ENGINEERING & MFG. CO.

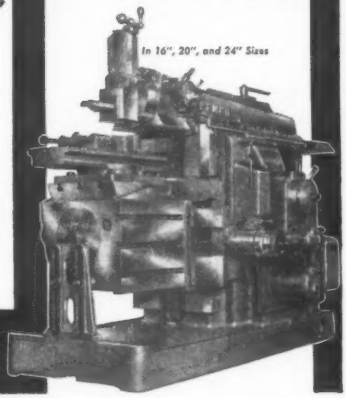
Manufacturers of Precision Machinery Since 1917

ST. LOUIS 4, MISSOURI

GEMCO

Multi-Purpose Shapers

In 16", 20", and 24" Sizes



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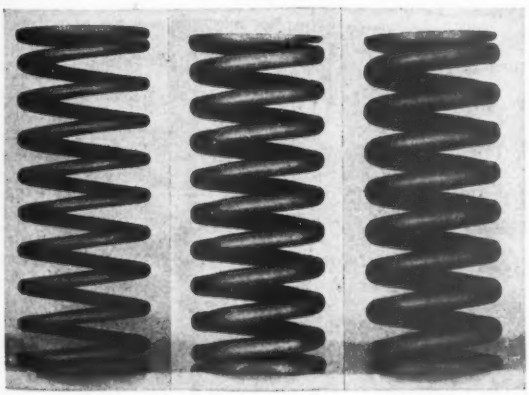

DIE SPRINGS

IN STOCK FOR PROMPT SHIPMENT

Three lines of standard Die Springs — medium pressure, medium-heavy pressure, and high pressure. In addition to our large stock of standard Die Springs, we can give you fast service on "specials". Tell us the free length, outside diameter, pitch and size of wire — and we'll make quick deliveries to your specifications. All of our Die Springs are precision made for longer life and "trouble free" operation.

DIE SUPPLY COMPANY

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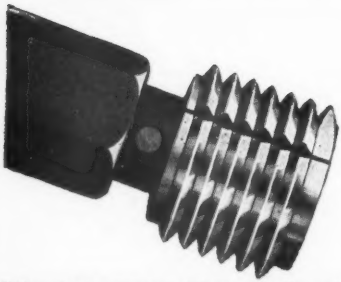


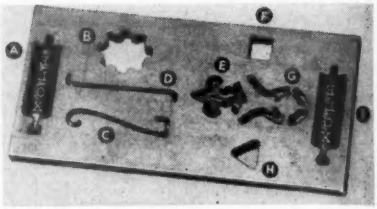
That Unseen Extra Quality

A Big League Star has it
The NEW V-nide has it

Depend on the new V-nide gage for longer wear and accurate checking. Consider! On aluminum, V-nides gaged 4532 holes per .0001 of wear, against 338 holes per .0001 for tool steel gages. With only an approximate 17% increase in price for V-nides, your gaging costs should hit a new low.

Republic Gage Co.
2228 Fenkell Ave., Detroit 21, Michigan

V-nide

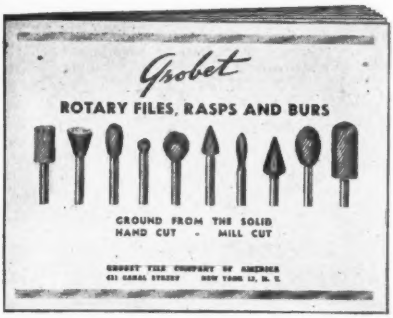


Elox Spark Drilling

Disintegrator Drilling is the most recent development of the Elox Corporation, Dept. D, 838 Maccabees Bldg., Detroit 2, Mich. The advantages of "drilling" shaped holes in either hard or soft steel shows a distinct advantage over more conventional methods. Either a solid or hollow electrode may be used, depending usually on the easiest method of fabricating the electrode. This illustration shows a number of irregular holes. The square and triangular holes, figures F and H, were made with a hollow electrode. The side walls are fairly smooth and require only a small amount of hand finishing. There is a slight taper towards the top surface which can be used to advantage for slug clearance in piercing dies, and in the opposite direction, in producing formed holes in extrusion dies for the plastic industry. The electrode which formed the slot in figures C and D was made of strip stock with the coolant directed along the outside of the electrode. The shapes shown in figures B and E were produced with a solid electrode made to customer specifications. Noticeable in figure E is the clean detail along the edge of the work. Figure G, which takes the general shape of a horseshoe, was made with a hollow electrode forming the central part with the extended parts welded to the electrode. Elox electrical disintegration has been known to the engineering profession for over two years. It is apparent as more and more applications are found for disintegrator drilling that the average machine shop cannot afford to be without a disintegrating machine. There is rapidly developing an entirely new technique in the field of die making which is bound to become indispensable as more and more is learned about its application.

INFORM-A-GRAM KEY No. 907-B

SEND FOR NEW CATALOG YR



• *Just off the press* — the most complete of its kind, illustrating the full line of GROBET ROTARY FILES, CUTTERS, DIESINKER'S BURS, etc., in size, shape and coarseness of cut for every industrial purpose.

(Please make your request for "Catalog YR" on your firm letterhead)

GROBET FILE CO. of AMERICA

421 Canal Street — 1812 F. L. GROBET — **New York 13, N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

PLANTS: NEW YORK, CHICAGO, LOS ANGELES

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DIE MAKING MACHINES WILL SAVE YOU

50% to 60% of the Labor, over hand methods

on DIES, GAGES, CAMS, TEMPLATES, STRIPPER PLATES — WORK IS MORE ACCURATE AND COMPLETED ON TIME.

A real time and money saver for your conversion program.

Oliver Die Making Machines are available for bench and floor use. Small machines with 1″ Capacity. Large machines with 3″ Capacity.

A machine for every sawing, filing and lapping operation and priced within the reach of every shop. Avoid substitutes —"Demand the Original Oliver."

Cut illustrates S-1 Bench Machine, 1″ Capacity, price $125.

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REPLACEABLE-FACE

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With NEW All-Purpose Faces

BASA Replaceable Face Hammers hit hard, but won't mar or dent — ideal for use on easy-to-damage material. Yet they're rugged and resilient—won't chip, split, mushroom.

Perfect balance and handy grip help reduce vibration, cushion shock, avert fatigue.

Faces are quickly adjusted or replaced in the adjustable head . . . only one nut to loosen or tighten.

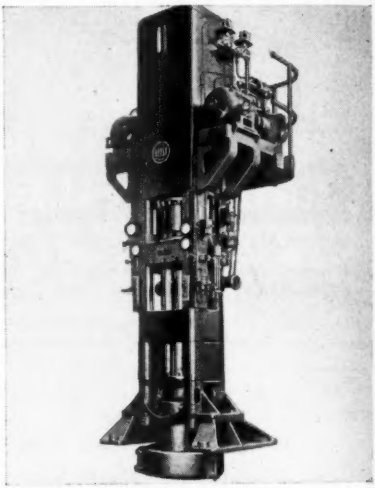
Write for Bulletin

GREENE, TWEED & COMPANY

Bronx Blvd. at 238 St., New York 66, N. Y.

Duplex Hydraulic Press

For pressing deep sections and flanged objects in powdered metals wherein one portion of the work must be pressed at a different speed, this 200-ton, Duplex Hydro-Dynamic Press was designed by E. W. Bliss Co., Dept. TPM, 53rd St., and 1st Ave., Brooklyn 32, N. Y. These presses feature independent pressure, control stroke control and speed control

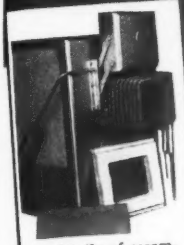


of each slide, and are available in capacities ranging from 50 to 5000 tons. Separate pumping units for each slide provide for an infinitely varied relation of speeds of the two slides. Electrical control on all presses provides for readily changeable sequences of slide movement for various work. The automatic operating cycle includes this sequence of movements: quick closing to the work; simultaneous pressing by the two slides at predetermined adjustable speeds and pressures; automatic reversal of the upper slide; use of the lower slide as ejector; timed pause for loading; automatic return of the lower slide. Automatic loading devices are supplied in conjunction with the operational cycle. Core rods for bushing work can be furnished when required.

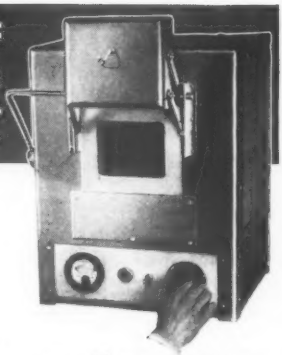
INFORM-A-GRAM KEY No. 212-B

NEW **TEMCO** ELECTRIC MUFFLE FURNACE

Model OFE . . . for Shop and Laboratory



● Muffle of ceramically bonded aluminum oxide is replaceable complete with nickel-chrome heating element or separate coiled heating element can be furnished for rewinding old muffle core.



SPECIFICATIONS

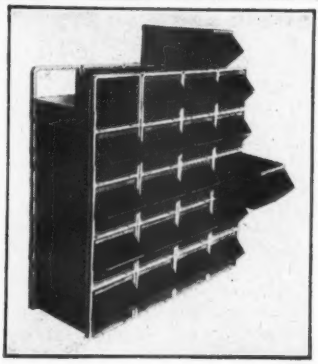
Size—Overall 22" x 34" x 18"
Muffle chamber 6" x 5" x 10"
Operating temperature
Continuous 1600° F.
Intermittent 1900° F.
Current consumption
2000 Watts maximum
Shipping weight 170 lbs.
Price—115V. or 230V. $194.00

A sturdy, modern electric furnace, with maximum convenience and economy in operation.

On the instrument panel is mounted a dependable pyrometer calibrated to 2000° F. and 1100° C., and a synchronous motor driven percentage timer which controls the current input. By turning the "TEMCO-TROL" knob the heating period is adjustable from 2% to 98% of a one minute cycle, giving close temperature selection over the full heating range.

See your supply house or write

THERMO ELECTRIC MFG. CO., 474 W. Locust St., Dubuque, Ia.



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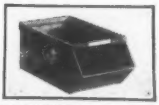
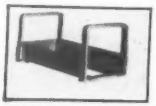
Because Stackbins are portable containers—not fixtures—tools, parts and materials can be carried to departments, from machine to machine, or held in stockrooms without being transferred from one container to another. Stored in Stackracks, any Stackbin is instantly accessible when its contents are needed—without disturbing any other bin.



STACKBINS are individual hopper-fronted stacking bins, designed for storage, transportation and assembly.



STACKRACKS are individual units which lock together to form storage racks of any size, shape or capacity, into which Stackbins slide like drawers.

STACKBINS IN STACKRACKS

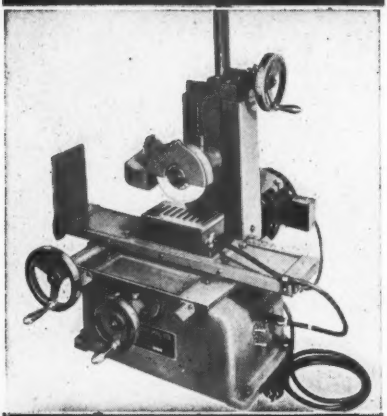
Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa.

WRITE STACKBIN CORP., 97 TROY ST., PROVIDENCE 1, R. I.

STACKBIN SYSTEM

"Stacked and Still Accessible"

SANFORD



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SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

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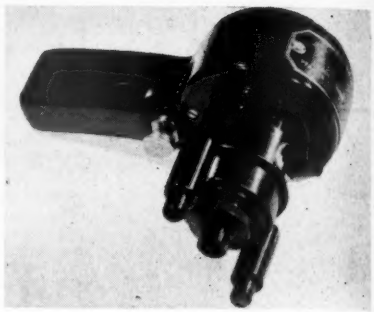
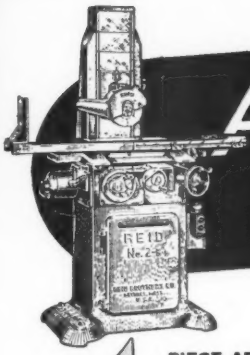


Model 33 Shego Rivet Finisher

This precision built, portable, air turbine driven, vertical spindle milling tool is made by the Pfahler Mfg. Corporation, Dept. J, 405 Lexington Ave., New York 17, N. Y. It removes protruding portions of aluminum alloy flush rivet heads, leaving them precisely level with the immediate surrounding surface, and can be operated by unskilled workmen. The manufacturer who uses this tool may allow every rivet head, as driven, to project above the surface for insuring consistently tight riveted construction without sacrifice of aerodynamic smoothness, thus avoiding the dangers incident to excessive countersinking. The tool operates independently of surface irregularities for the end mill cutter covers only the rivet head and the depth of cut is controlled by a collar surrounding the cutter. On the sides are stabilizer pads, spring-backed to compensate for surface irregularities, to steady the tool in its cutting position. Model 33 weighs 4 lbs and measures 3" x 5" x 7" and is controlled by a button type valve in the handle. Exhaust from the turbine is employed in an injector arrangement that draws air from the outside into the adjustable-stop opening around the cutter, thus picking up the chips and carrying them into the stop to be discharged through the exhaust manifold. A chip collector can be attached to this opening to keep the work surfaces clean. Air pressure at 90 lbs or more is required to operate the turbine. Interchangeable cutters are in sizes of from $\frac{5}{16}$" to $\frac{9}{16}$" in diameter.

INFORM-A-GRAM KEY No. E53-B



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at it's BEST!
"To the Tenth!"

PIECE AFTER PIECE - HUNDRED AFTER HUNDRED - ACCURACY AT IT'S BEST - REID GRINDERS ARE BUILT TO PRODUCE THAT RESULT - CLOSE TOOL ROOM WORK OR GANG-UP PRODUCTION ARE AT YOUR FINGER-TIPS ON A REID GRINDER.

Send for Catalog and Price List Today

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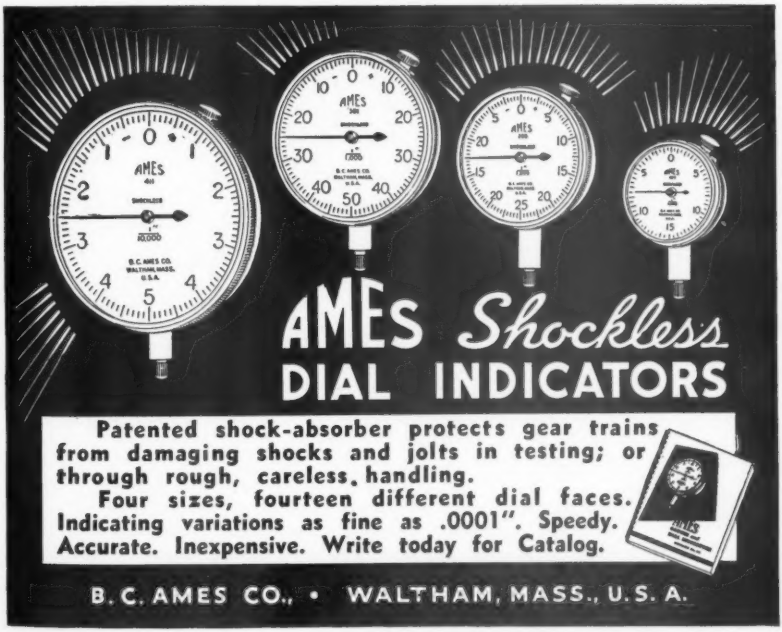
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DIAL INDICATORS
Patented shock-absorber protects gear trains from damaging shocks and jolts in testing; or through rough, careless, handling.
Four sizes, fourteen different dial faces. Indicating variations as fine as .0001". Speedy. Accurate. Inexpensive. Write today for Catalog.
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BUILDERS 'T' SURFACE GRINDER

The
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TAPS—A HANDBOOK FOR USERS. For most tapping, there is a conventional design of taps that may be chosen from the standard tap catalog. Such taps are made for average conditions and their construction follows principles developed through many years of experience and use. In a new handbook, clearly printed in heavy, grease-resistant card stock, designed to stand up under hard use in the shop, Charles H. Besly & Company, Dept. T, 118-124 N. Clinton St., Chicago 6, Illinois, devotes several pages to methods of altering standard taps to meet various conditions. The book contains easily understood instructions, in the form of reference charts and drawings, on just about everything the tap user needs to know. There's a guide for selecting taps to be used in producing class 2 and class 3 fits; an illustrated formula for finding the safe drill size for any desired percentage of thread; pointers on selecting the machine, preparing the hole, operating speeds, lubricants; chapters on tap sharpening, screw thread terms and definitions and much other useful data.
INFORM-A-GRAM KEY No. 915-B

PRECISION MEASUREMENT IN THE METAL WORKING INDUSTRY, VOL. 2, prepared by the Department of Education of International Business Machines Corp., has entirely new text and illustrations. This text includes the substance of the last five chapters of the twelve-chapter edition in which the complete work formerly appeared, but the material has been completely rewritten and expanded into seven chapters to include new developments in the field. The complete coverage of the text is indicated by the several chapter titles, i.e., Surface Plates and Accessories; Angles; Comparison Measurement; Optical Instruments; Measuring Machines; Surface Roughness; and Hardness Testing; all told, 285 pages of detailed and painstakingly presented know-how. To each chapter has also been added a brief introductory section in which definitions of terms and other fundamentals necessary to the presentation are given. In preparing the new material, the Department of Education has had the active collaboration of the engineering and manufacuring departments of IBM, thus insuring development of the text as a practical work based on actual shop experience. It has also had the benefit of the experience and, in many cases, the constructive criticisms, of instructors, both military and civilian, who have used the previous edition as a working text-book in government arsenals, Army and Navy schools, industrial training classes, and technological and vocational schools. Published by the Syracuse University Press, Dept. T, 922 Irving Ave., Syracuse 10, N. Y.

SAE HANDBOOK, 1945 EDITION, now being distributed to members of the Society of Automotive Engineers, presents new SAE Standards on electrical equipment and non-metallic materials, and revised SAE Standards on gasoline engines, iron and steel, lighting, nonferrous metals, and parts and fittings.

The new standards cover starting motor and generator curves, generator and starter mountings, starter pinion and ring gears, and windshield wiper hose. Revised standards include methods of determining steel hardenability, steel hardness conversion numbers, automotive gray iron castings, NE steels, automobile wiring, insulated cable, and license plate lamps.

The 620 pages of text contain all SAE official current standards and recommended practices, except those which are aeronautical, plus general data having important bearing upon both standards and recommended practices. The new volume supersedes all earlier editions.

To the extent of a limited supply, the Handbook will be made available to nonmembers of the Society at $5 per copy. Orders may be placed with Society of Automotive Engineers, 29 West 39th Street, New York 18, N. Y.

PRECISION GAGES are more than fine tools; they are patterns of extreme exactitude with which to compare your work. That is why gages must be used with care and be

SHOP AIDS

protected from damage. A worn or damaged gage can give only an incorrect check on your work. A well prepared, convenient handbook designed to help the gage user, entitled "GAGES, Their Use and Care" is available from Vard, Inc., Dept. TJ, Pasadena 8, Calif.

In addition to instructions on the use and care of gages, other valuable information covering threads, useful formulas ,and trigonometric functions tables are included in this handbook.
INFORM-A-GRAM KEY No. 509-B

RECONVERSION INVENTORY KIT—To facilitate quick, easy reconversion inventories of industry's most widely used general purpose equipment, the Allis-Chalmers Mfg. Co. announces that it will soon begin to distribute a newly prepared reconversion inventory kit, covering centrifugal pumps, V-belt drives, and electric motors. Because much equipment has been worked during wartime three and four times as many hours a year as in peacetime, calendar age may mean nothing. Through necessity, much equipment has been misapplied, and repair has often depended on American ingenuity and baling wire.

An extension of Allis-Chalmers' wartime aid-to-maintenance program, the kit will enable the user to determine the exact condition of each piece of existing equipment which is scheduled for peacetime production duty. Standards which generally apply to all makes of the same type of equipment determine which units are (1) okay as is, (2) need new parts, (3) will shortly require replacement, (4) need immediate replacement, (5) need reapplication, (6) are obsolete, or (7) may have parts of second or third-choice materials that were dictated by wartime shortages.

The kit contains a set of three fact sheets, one for each type of unit, with suggestions for inventory procedure, and a set of three check lists which summarize the procedures and permit detailed appraisal of each unit. These reconversion inventory kits are available by request from the Allis-Chalmers Mfg. Co., Dept. TJ, Milwaukee 1, Wisconsin.
INFORM-A-GRAM KEY No. 183-B

FILE FILOSOPHY and How to Get the Most Out of Files, being a brief account of the history, manufacture, variety and uses of files in general, is published by the Nicholson File Co., Dept. TJ, 95 Acorn St., Providence, R. I.

From a short historical account of the development and evolution of the file, the material presented goes into present day types of

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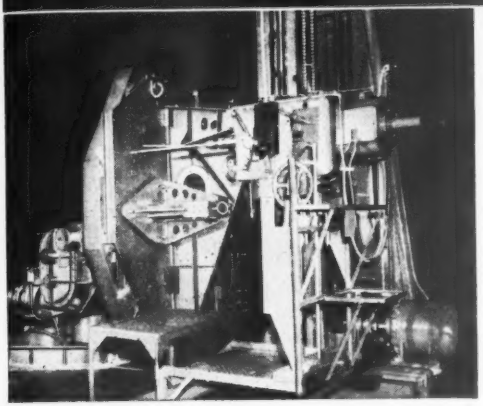

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C-F Positioners were developed to permit "*down hand*" welding of *all sides and angles* on weldments, of any shape and practically any weight, *with a single set-up*. Today, they are not only standard equipment in the welding shop, but have also moved into the machine shop where they are used as universal handling and holding fixtures. Ranging in capacities from 1200 lb. to 30,000 lb., C-F Positioners rotate loads (360°) at any desired r.p.m. and/or tilt them (to 135° beyond horizontal) under push button control. The No. 14 C-F Positioner (illustrated) is being used to support and "position" a cumbersome assembly, permitting the drilling of many holes, which without the positioner would require a series of costly set-ups.

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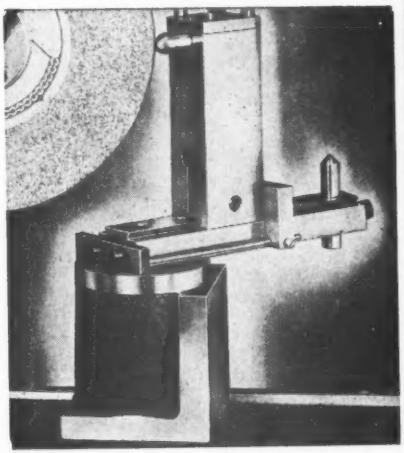

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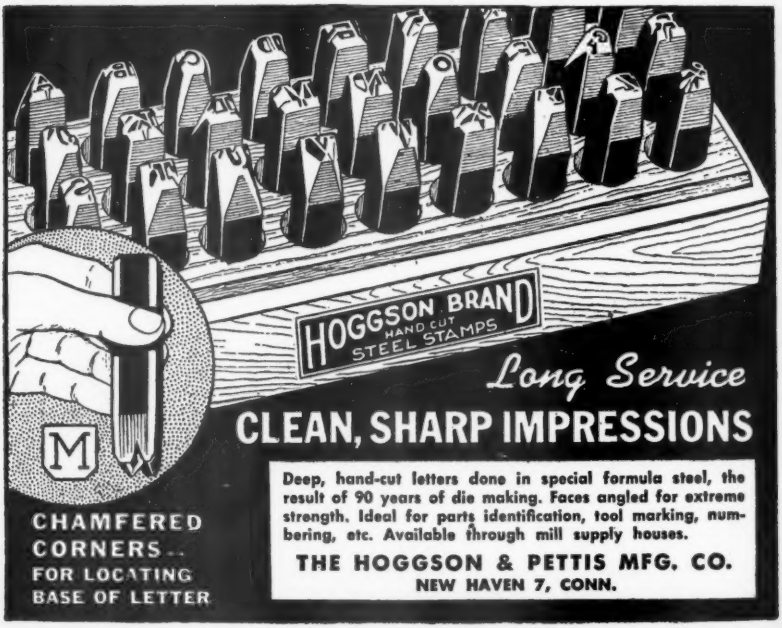
files and the process of manufacturing them.

Because there are thousands of cuts and sizes of files, "the right file for the job" is an important factor in producing good work. There being a right and wrong method of filing, photographs illustrate clearly the proper method to use in working on various types of materials from rough castings through die castings, stainless steel, aluminum, brass, lead, soft metals, plastics, saws, to precision-instrument making. 48 pages of interesting information.
INFORM-A-GRAM KEY No. E31.5-B

MANUAL CATALOGUE of National Foreman's Institute, Inc. This catalogue offers a brief description of the manuals and other training materials and services which are offered by the National Foremen's Institute, Inc., Dept. DJ, Deep River, Connecticut.

Today, more than ever, foremanship development programs are needed by industry and management. Fifty-six items are listed covering machine operation, safety, labor relations, foremanship conferences and services. Among the many aids to supervision presented and which have had a wide acceptance on the part of management are: The Foreman's Letter, The Executive's Labor Letter; The Supervisor's Memory Jogger; and The Daily Diary. Sample copies of these will be supplied upon request.
INFORM-A-GRAM KEY No. E35-B

INTRODUCTION TO ELECTRONICS. To provide an understanding of the principles of electronics and an idea of the part electronics will play in future industrial developments, a 20-page book entitled, "Introduction To Electronics," has been produced by the Allis-Chalmers Mfg. Co. The new educational bulletin was prepared by Dr. Walter Richter, recognized as one of the outstanding engineers in this promising electrical field. A brief discussion on the fundamentals of conversion and control of electric power in a load prefaces introduction of the subject of electron tubes. Approaching this subject as a guide for application engineers, instead of tube designers, the book explains that the electron tube is a new control element which is nothing but a special type of rheostat or switch. The discussion of tubes is divided into two main parts: vacuum and gaseous. Difference between a vacuum tube and the equivalent mechanical device, methods of specifying tube performance, application of tube characteristics for design purposes, and use of the high speed response of the tube are explained.



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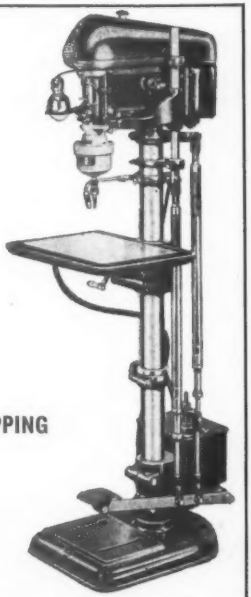

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Clearly presented are principles of tube detector action with applications, and principles of tube oscillators with application to induction and dielectric heating. Line drawings, curves, and sketches add materially to comprehension. This booklet, E6358, is available upon request from the Allis-Chalmers Mfg. Co., Dept. T-3, 658, Milwaukee 1, Wis.
INFORM-A-GRAM KEY No. 183-B

A MATERIALS HANDLING ANALYSIS GUIDE has just been published by TOW-MOTOR CORP., manufacturer of power lift trucks and industrial tractors. It is being offered free to anyone interested in locating and analyzing handling problems in factories, terminals and warehouses. It is perhaps the first booklet any manufacturer has published on this important though little understood subject. The 36-page pocket-size booklet, which discusses handling from an executive viewpoint, is divided into three major sections: (1) How To Tell If You Need Better Handling Methods; (2) Analyzing The Problem; and (3) Determining The Solution To Your Problem. There are thirty-one illustrations which help to point out ways of improving handling methods. All the well known types of power handling equipment are illustrated and discussed with the object of determining their ability to meet requirements. This Guide is impartial, informative and helpful. It may be obtained by writing, on your company letterhead, to Towmotor Corp., Dept. T-8, Cleveland 10, O.
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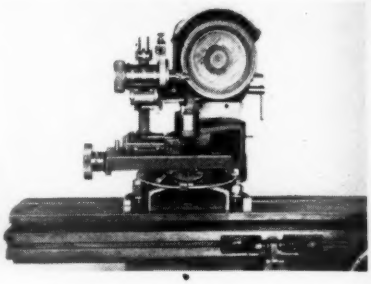
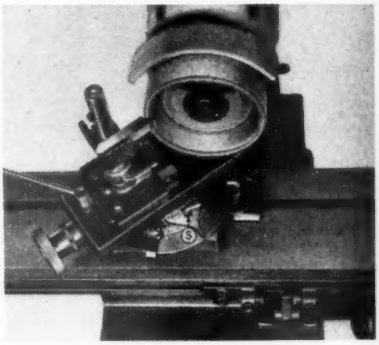
A new radius and angle forming instrument, known as Radiform, has been developed by the W. F. Meyers Company, Inc., Bedford, Indiana. This device will generate radii and angles tangent to radii on end mills (Fig. 1), die sinking tools, drills, and reamers, both straight and spiral fluted, directly against a grinding wheel without pre-





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(TO PAGE 180—PLEASE)

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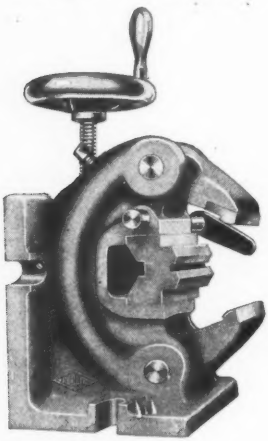

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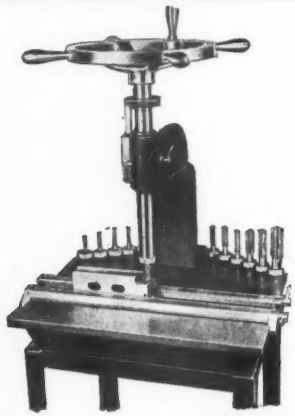
Gage Co. Division
Universal Engraving & Colorplate Co., Inc.
COMPARATORS
Fish-Schurman Corp.
Scherr Co., Inc., George
Trico Products Corp.
COMPARATORS—Optical
Fish-Schurman Corp.

CONTOUR METAL WORKING MACHINES
DoAll Company, The
CONTROLS—Air
Tomkins-Johnson Co., The
COOLANT SYSTEMS
Gray-Mills Co.
COOLERS—Air
Niagara Blower Co.
COOLING SYSTEMS—Spot Welder
Gray-Mills Co.
CORE BITS
Wheel Trueing Tool Co.
COUNTERBORES
Acme Tool Co.
Bokum Tool Co.
Carboloy Co., Inc.
Cleveland Twist Drill Co.
Continental Tool Wks., Div. of Ex-Cell-O Corp.
Firth-Sterling Steel Co.
Gairing Tool Co., The
Genesee Mfg. Co., Inc.
Mohawk Tool Co.
National Twist Drill & Tool Co.
Putnam Tool Co.
Wesson Products Co.
COUNTERBORES—Special
Detroit Reamer & Tool Co.
COUNTERSINKS
Continental Tool Wks., Div. of Ex-Cell-O Corp.
Gairing Tool Co., The
Severance Tool Industries, Inc.
Wesson Products Co.
CRANES
Cullen-Friestedt Co.
CUT-OFF MACHINES
Challenge Machinery Co., The
Delta Mfg. Co.
CUTTERS—Boring
Gairing Tool Co., The
Gorton Machine Co., George
CUTTERS—Deburring
Severance Tool Industries, Inc.
CUTTERS—Diamond Glass (See DIAMOND GLASS CUTTERS)
CUTTERS—Die Sinking
Gorton Machine Co., George
Tomkins-Johnson Co., The
CUTTERS—Engraving
Gorton Machine Co., George
Preis Engraving Co., H. P.
CUTTERS—Fly
Clark Co., Robert H.
CUTTERS—Hand Power
Lewthwaite Machine Co., T. H.
CUTTERS—Hard Carbide
Allegheny Ludlum Steel Corp.
Firth-Sterling Steel Co.
Ford Mfg. Co., Inc., M. A.
Gairing Tool Co., The
Gorton Machine Co., George
National Twist Drill & Tool Co.
Pipe Machinery Co., The
Putnam Tool Co.
Severance Tool Industries, Inc.
Super Tool Co.
Tomkins-Johnson Co., The
Wesson Products Co.
CUTTERS—Thread Milling
Armstrong Bros. Tool Co.
Gairing Tool Co., The
Pipe Machinery Co., The
Sossner Tap & Tool Co.
U. S. Machine Tool Mfg. Corp.
Wesson Products Co.
CUTTERS—Wire Rope
Lewthwaite Machine Co., T. H.
CUTTING TOOLS—Cemented Carbide
Allegheny Ludlum Steel Corp.
Wesson Products Co.
CUTTING TOOLS—Special
Continental Tool Wks., Div. of Ex-Cell-O Corp.
Masterform Tool Co.
National Twist Drill & Tool Co.
Super Tool Co.
U. S. Machine Tool Mfg. Corp.
Zimmerman Packing Co.
CYLINDERS—Air
Anker-Holth Mfg. Co.
Mead Specialties Co.
Tomkins-Johnson Co., The
CYLINDERS—Hydraulic
Tomkins-Johnson Co., The

DEMAGNETIZERS
Acme Tool Co.
Alofs Mfg. Co.
DESIGNING AND DRAFTING
Bunell Machine & Tool Co.

DESIGNING & ENGINEERING
McKinney Tool & Mfg. Co.
DIALS—Etched Plastic
Eastern Etching & Mfg. Co.
DIAMOND BORING TOOLS — (See BORING TOOLS—Diamond)
DIAMONDS—Industrial
Meyers Co., Inc., W. F.
DIAMOND HONES
Carborundum Co.
DIAMOND POWDERS
Ace Abrasive Laboratories
DIAMOND TOOLS
Diamond Tool Co., Not Inc.
Koebel Diamond Tool Co.
Smit & Sons, Inc., J. K.
Wheel Trueing Tool Co.
DIE CASTING MACHINES
Lester-Phoenix, Inc.
DIE CENTERS—Hard Carbide
Firth-Sterling Steel Co.
DIE FILING MACHINES
Illinois Tool Works
Milwaukee Chaplet & Mfg. Co.
Oliver Instrument Co.
DIE HANDLING TRUCKS
Hamilton Tool Co., The
DIE MAKERS' SUPPLIES
Acme Industrial Co.
Carboloy Co., Inc.
Continental Machines, Inc.
Danly Machine Specialties, Inc.
Detroit Die Set Corp.
Die Supply Co.
Producto Machine Co., The
Star Machine & Tool Co.
DIE SECTIONS—Composite Steel
Allegheny Ludlum Steel Corp., Forging & Casting Div.
Firth-Sterling Steel Co.
DIE SETS
Danly Machine Specialties, Inc.
Detroit Die Set Corp.
Die Supply Co.
Producto Machine Co., The
DIE STEEL (See STEEL — Tool & Die)
DIE STOPS—Automatic
West, R. C.
DIE SUBSTITUTE MACHINES
O'Neil-Irwin Mfg. Co.
DIES
Alofs Mfg. Co.
Armstrong Bros. Tool Co.
Barth Stamping & Machine Works
Bone Tool & Gauge Co.
Davis Tool & Engineering Co.
Denning Mfg. Co., The
Dresel-Betz Co.
General Die & Tool Co.
Harley Wire Die Co.
Lorain Machine & Tool Co., The
Master Gauge Co.
McKinney Tool & Mfg. Co., The
National Machine Tool Co.
Paramount Tool Co.
Rane Tool Co., Inc.
Schraner & Co., A. P.
Triangle Engineering Co.
Variety Machine & Stamping Co.
Viking Tool & Machine Corp., The
Whistler & Sons, Inc., S. B.
DIES—Bail
Armstrong Bros. Tool Co.
DIES—Carbide
Firth-Sterling Steel Co.
DIES—Die Casting
Federal Tool Corp.
DIES—Forming
Algoma Products
DIES—Master Washer
Horis Screwlock Co.
DIES—Pipe
Armstrong Bros. Tool Co.
DIES—Plastic Molding
Federal Tool Corp.
DIES—Press Brake
Dreis & Krump Mfg. Co.
DIES—Punch Press
Federal Tool Corp.
DIES—Punching & Notching
Whistler & Sons, Inc., S. B.
DIES & STOCK SETS
Armstrong Bros. Tool Co.
DIES—Template
Algoma Products
DIES—Threading
Armstrong Bros. Tool Co.
DISCS—Abrasive
Besly & Co., Charles H.
DIVIDERS
Lufkin Rule Co.
Oliver Instrument Co.
DOGS—Lathe & Milling Machine
Armstrong Bros. Tool Co.



Lassy TAPPER

PATENTS PENDING

SAVES TIME, TAPS, EXPENSIVE LABOR

You can tap twice as many holes, quicker with the Lassy Tapper, than with a tap wrench.
It is complete; no wrenches needed.
Always right angle holes—no rejects.
Anyone can tap holes exactly to specifications.
Tap capacity ⅛″ thru 1″.

STEPPED HOLDING BARS

Replace Vise, grip work firmly—prevent tap-breaking torque.

DEPTH GAUGE

Set instantly without tools.
Always shows depth tap has travelled.

Eliminates guess work, prevents "freezing" taps in bottom of blind holes.

TAP ADAPTERS

No extra spindles needed.
Change taps in a jiffy.

Send for folder

LASSY TOOL COMPANY
96 Bohemia Street
PLAINVILLE, CONN.

(CONTINUED FROM PAGE 178)

and minute radii, or radii with tangent angle if desired. The positive stop control prevents undercutting and allows the operator to see the work being formed at all times, greatly reducing the time required to finish the work.

Difficult radius forming jobs, heretofore done by hand by highly skilled men requiring hours of time with constant checking, are now being done in a fraction of an hour with positive predetermined and extremely accurate results. By using the proper wheel, high speed tools are given a very fine finish without honing or finish grinding. Carbide tipped and insert tools do not require lapping when formed against a diamond wheel of the proper grit.

The Radiform Wheel and Tool Former will form concave and convex radii with angles tangent or concave-convex blended radii on tool bits and milling cutters. Fig. 2 illustrates a machine setup in which a ¼″ concave radius is being formed and without change of setup, but with the proper dial settings, a ⅛″ convex radius can be blended into the ¼″ concave radius.

The Radiform is also used to produce form grinding wheels for the production of form tools. Radii and angles on tool bits, milling cutters, etc., having different front and side degree clearance angles are formed and blended in one setup and operation.

No special skill is required to operate the fixture, which can be mounted on different types of grinder tables. Versatility, ease of operation and accuracy make it desirable for shop and production tool forming use.

INFORM-A-GRAM KEY No. 677-B

The standard dressing for rubber belts which was satisfactory on natural rubber belting will also prove effective on the new GR-M synthetic rubber belting recently developed by B. F. Goodrich Company.

The new GR-M belting will not absorb the dressing, and care must be taken not to apply more than necessary, as this may result in slippage, the company warns. Use of the dressing allows belts to produce greater horsepower and to operate under a load with less tension than if operating without dressing.

DOWEL PINS
Acme Industrial Co.
Danly Machine Specialties, Inc.
Detroit Die Set Corp.
Die Supply Co.
Producto Machine Co., The
DRAWBARS
General Die & Stamping Co.
DRESSERS—Angle
J & S Tool Co.
DRESSERS—Diamond
Carboloy Co., Inc.
Meyers Co., Inc., W. F.
DRESSERS—Radius
J & S Tool Co.
Scherr Co., Inc., George
DRESSERS—Wheel
Lee Co., K. O.
DRESSING STICKS
Carborundum Co.
Norton Co.
DRILL DRIFTS
Armstrong Bros. Tool Co.
DRILL JIG BUSHINGS
Acme Industrial Co.
Colonial Bushings, Inc.
DRILL POINTERS
Oliver Instrument Co.
DRILL PRESS (See PRESSES—Drill)
DRILL ROD
Allegheny Ludlum Steel Corp.
Darwin & Milner, Inc.
Latrobe Electric Steel Co.
DRILLING ATTACHMENTS
Rusnok Tool Works
DRILLING—Disintegrator
Elox Corp.
DRILLING HEADS—Adjustable
Lindemre Machine & Tool Co., Inc.
DRILLING HEADS—Turret
Madco Products, Inc.
DRILLING MACHINES
Sommer & Adams Co., The
DRILLS—Swiss Pattern
Armstrong Bros. Tool Co.
DRILLING & REAMING MACHINES—Deep Hole
Builders Iron Foundry
DRILLS—Carbide Tipped
Goral Tool Co.
DRILLS—Core
Ex-Cell-O Corp.
DRILLS—Hardsteel
Black Drill Co. (Div. Black Industries)
Die Supply Co.
DRILLS—High Speed, Straight Shank
Eastern Tool Supply Co.
DRILLS—Oil Hole
Detroit Reamer & Tool Co.
DRILLS—Ratchet
Armstrong Bros. Tool Co.
DRILLS—Tool-Forged
Republic Drill & Tool Co.
DRILLS—Sensitive
Production Machine Co.
DRILLS—Special
Detroit Reamer & Tool Co.
DRILS—Twist
Cleveland Twist Drill Co.
National Twist Drill & Tool Co.
DRIVES—Gearshift
Lima Electric Motor Co., The
DRIVES—Motorized
Master Electric Co., Industrial Equipment Div.
DUPLICATOR MACHINES
Gorton Machine Co., George
O'Neil-Irwin Mfg. Co.
DUPLICATORS
Detroit Universal Duplicator
Turchan Follower Machine Co.
DUST COLLECTORS
Acme Tool Co.
Standard Electrical Tool Co., The

EDGES—Straight
Acme Tool Co.
Challenge Machinery Co., The
Ford Motor Co., Johansson Div.
ELEVATORS—Portable
Economy Engineering Co.
END MILLS
Bokum Tool Co.
Gorton Machine Co., George
Putnam Tool Co.
Slewek Tool Div. of Domestic Industries, Inc.
U. S. Machine Tool Mfg. Corp.
Wesson Products Co.

END MILLS—Special
Detroit Reamer & Tool Co.
ENGINEERING SERVICE
Erickson Steel Co.
McKinney Tool & Mfg. Co., The
ENGRAVING MACHINES
Gorton Machine Co., George
Preis Engraving Machine Co., H. P.
ETCHERS—Acid, Pantographic
Preis Engraving Machine Co., H. P.
ETCHERS—Electric
Acme Tool Co.
Gorton Machine Co., George
Preis Engraving Machine Co., H. P.
ETCHING INK
Dykem Co., The
EXPERIMENTAL WORK
Merz Engineering Co.

FACERS
Clark Co., Robert H.
FEED FINGERS
Hardinge Brothers, Inc.
FEED REGULATOR—Drilling, Milling
Special Devices Co.
FEEDS—Air Operated
Bellows Co., The
Mead Specialties Co.
FEEDS—Die
Dickerman Mfg. Co., H. E.
FEEDS—Hitch
Dickerman Mfg. Co., H. E.
Die Supply Co.
FILES—Ebonite
Heller Brothers Co.
FILES—Rotary
Die Supply Co.
Nord Mfg. Co., Inc., M. A.
Grobet File Co. of America
Hamilton Tool Co., The
Heller Brothers Co.
Nicholson File Co.
Severance Tool Industries, Inc.
FILES—Swiss Pattern
Grobet File Co. of America
FILING MACHINES—Continuous
DoAll Company, The
FILING MACHINES—Die
Illinois Tool Works
Milwaukee Chaplet & Mfg. Co.
Oliver Instrument Co.
FILTERS—Air Line
M-B Products
FIXTURES
Bone Tool & Gauge Co.
Cleveland Universal Jig Co.
Dresel-Betz Co.
Electrix Corp.
Enterprise Machine Parts Corp., The
Federal Tool Corp.
General Die & Tool Co.
Lorain Machine & Tool Co.
Master Gauge Co.
McKinney Tool & Mfg. Co.
Merz Engineering Co.
Moore Special Tool Co., Inc.
Paramount Tool Co.
Sommer Tap & Tool Co.
Star Machine & Tool Co.
Ulmer Co., The J. C.
Viking Tool & Machine Corp., The
Vinco Corp.
FIXTURES—Broaching (See BROACHING FIXTURES)
FIXTURES—Grinding (See GRINDING FIXTURES)
FLEXIBLE SHAFTS
Precise Products Co.
FLEXIBLE SHAFT MACHINES
Acme Tool Co.
FLOATING HOLDERS
Gairing Tool Co., The
FORGINGS—Steel
Allegheny Ludlum Steel Corp.
Latrobe Electric Steel Co.
FORGINGS—Water & Oil Hardening
Allegheny Ludlum Steel Corp., Forging & Casting Div.
FORMERS—Wheel & Tool
Meyers Co., Inc., W. F.
FORMING TOOLS
Cooper-Bessemer Corp., The
Hardinge Brothers, Inc.
Wesson Products Co.
Wheel Trueing Tool Co.
FORMING TOOLS—Special
Detroit Reamer & Tool Co.
FURNACE HEATING ELEMENTS—Electric
Carborundum Co.
FURNACE REFRACTORIES
Carborundum Co.

FURNACES—Case Hardening
Cooley Electric Mfg. Corp.
Johnson Gas Appliance Co.
FURNACES—Electric Heat Treating
Cooley Electric Mfg. Corp.
Thermo Electric Co.
FURNACES—High Speed Steel
Johnson Gas Appliance Co.
FURNACES—Laboratory
Cooley Electric Mfg. Corp.
Thermo Electric Co.
FURNACES—Melting
Johnson Gas Appliance Co.
FURNACES—Soldering
Johnson Gas Appliance Co.
Yost Mfg. Co.
FURNACES—Tempering & Drawing
Cooley Electric Mfg. Corp.
Johnson Gas Appliance Co.

GAGE BLOCKS
Dearborn Gage Co.
Ford Motor Co., Johansson Div.
Scherr Co., Inc., George
Webber Gage Co.
GAGE HANDLES
Federal Tool Corp.
Great Lakes Metal Specialties & Mfg. Co.
GAGE TOOLS
Wheel Trueing Tool Co.
GAGES—Built-Up
Master Gauge Co.
Perfex Gage & Tool Co.
Turner Gauge Grinding Co.
Vinco Corp.
GAGES—Carbide Tipped
Kennametal, Inc.
Tools & Gages, Inc.
GAGES—Center, Depth, Planer, Telescoping, Surface, Thickness, etc.
Lufkin Rule Co.
Tools & Gages, Inc.
GAGES—Concentricity
Master Gauge Co.
GAGES—Contour
Perfex Gage & Tool Co.
GAGES—Cylindrical
Pipe Machinery Co., The
GAGES—Depth
Lassy Tool Co.
GAGES—Dial
Federal Products Corp.
Sun Tool & Gauge Corp.
GAGES—Fixture
Perfex Gage & Tool Co.
GAGES—Flush Pin
Master Gauge Co.
Perfex Gage & Tool Co.
Turner Gauge Grinding Co.
GAGES—Grinding
Acro Tool & Die Works
GAGES—Height
Dickerman Mfg. Co., H. E.
GAGES—I.D. & O.D.
Federal Products Corp.
GAGES—Inspection
Comtor Co., The
GAGES—Internal Indicator Bore
Swedish Gage Co. of America
GAGES—Internal Setting
Dearborn Gage Co.
GAGES—Master Disks
Swedish Gage Co. of America
GAGES—Micrometer Dial
Ames Co., B. C.
GAGES—Multiple Inspection
Federal Products Corp.
Tools & Gages, Inc.
GAGES—Plain Plug & Ring
Acme Industrial Co.
Carboloy Co., Inc.
Elgin National Watch Co.
Master Gauge Co.
Merz Engineering Co.
Perfex Gage & Tool Co.
Pipe Machinery Co., The
Sav-Way Industries
Swedish Gage Co. of America
Tools & Gages, Inc.
Turner Gauge Grinding Co.
Vard, Inc.
Vinco Corp.
GAGES—Precision
American Measuring Instrument Corp.
Bunell Machine & Tool Co.
Gage Co. Division
Pipe Machinery Co., The
Star Machine & Tool Co.
Tools & Gages, Inc.
Turner Gauge Grinding Co.
Woodworth Co., N. A.

SPEED PRODUCTION
with *Quick Acting*
JOHNSON Furnaces

JOHNSON No. 120

1500° F. In 5 Minutes!

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2300° F. In 30 Minutes!

A low cost unit that is unexcelled for heat-treating high-speed steels . . . for hardening ANY steel dies, punches or tools. Compact, powerful and remarkably economical to operate. Gets the job done before conventional-type furnace heats up. Firebox 5 x 7¾ x 13½ lined with high temperature refractory. Easily regulated. Complete with Carbofrax hearth, G. E. Motor and Johnson Blower.

$129.50
F.O.B. Factory

JOHNSON No. 70

Reaches 2250° F. in 30 minutes from Cold Start!

Hi-Speed Bench Furnace

Designed primarily for high-speed steels, No. 70 is equally efficient for hardening any steel punches, dies, cutting tools, or small parts. Firebox 9 x 7¾ x 5 lined with high temperature insulating refractory. Complete with Carbofrax hearth, G. E. Motor and Johnson Blower.

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Write for Free Catalog Describing Complete Line of Johnson Furnaces.

JOHNSON GAS APPLIANCE CO.
575 E Avenue N. W. -:- Cedar Rapids, Iowa

Reed Cylindrical-Die Thread Roller

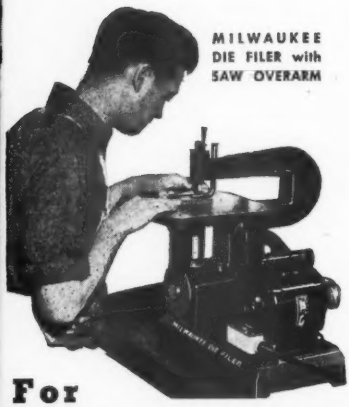
The Reed Thread Roller, product of Rolled Thread Die Co., Dept. D, Worcester, Mass., is particularly suited to threading hollow cylinders, short lengths, tapers, screws close to shoulders and precision screws. It solves numerous, difficult threading problems by adding simple and more precise controls, and greater range versatility to the recognized advantages of the thread rolling process. Cam-actuated, triple-die rolling permits of unlimited flexibility. Three synchronously rotating cylindrical dies, acting simultaneously on the blank floating between them, are controlled to give any desired cycle of squeeze, dwell and release through independent selection of cam and change gears. Threads can be formed quickly or gradually. Precision ground cylindrical dies that can be set up through graduated sizing and matching adjustments, assure economical production of uniformly accurate threads on all kinds of material ranging from soft, non-ferrous metals to semi-hard alloy steels. Model 21, Hand Feed has a nominal range of from $\frac{1}{8}$" to 1" dia and up to 1½" length. Special toolings can extend this range. Dies can be supplied in any standard or special thread form, and for burnishing, knurling, spinning, etc.

INFORM-A-GRAM KEY No. 544-B

GAGES—Profile
Gage Co. Division
Master Gauge Co.
GAGES—Snap
Master Gauge Co.
Perfex Gage & Tool Co.
Scherr Co., Inc., George
Tools & Gages, Inc.
Tubular Micrometer Co.
Turner Gauge Grinding Co.
Vard, Inc.
GAGES—Special
Acro Tool & Die Works
Barth Stamping & Machine Works
Federal Tool Corp.
Griffin Co., George O.
Lorain Machine & Tool Co., The
Metrical Laboratories, Inc.
Pipe Machinery Co., The
Sun Tool & Gauge Corp.
Swedish Gage Co. of America
Triangle Engineering Co.
Turner Gauge Grinding Co.
Ulmer Co., The J. C.
Vard, Inc.
Viking Tool & Machine Corp., The
Vinco Corp.
GAGES—Telescoping
Brand Tool & Supply Co.
Detroit Tap & Tool Co.
Federal Products Corp.
Merz Engineering Co.
Sossner Tap & Tool Co.
Tools & Gages, Inc.
GAGES—Thread Plug & Ring
Cadillac Gage Co.
Elgin National Watch Co.
Master Gauge Co.
Perfex Gage & Tool Co.
Pipe Machinery Co., The
Vard, Inc.
Vinco Corp.
GAGES—Tool Setting
Bartelt Engineering Co.
Tools & Gages, Inc.
GEAR BOXES
Western Aircraft Tool Co.
GEARS
Hartford Special Machinery Co., The
Taylor Machine Co.
GRADUATORS
Gorton Machine Co., George
GRINDER TOOLS
Norton Co.
Clark Co., Robert H.
GRINDERS—Abrasive Band & Disc
Stuart Industries, Inc.
Walls Sales Corp.
GRINDERS—Attachments
Cincinnati Grinders, Inc.
GRINDERS—Automatic Cycle
Cincinnati Grinders, Inc.
GRINDERS—Bench & Pedestal
Delta Mfg. Co., The
Sanford Mfg. Co.
Standard Electrical Tool Co., The
GRINDERS—Carbide Tool
Delta Mfg. Co., The
Gorton Machine Co., George
Hammond Machinery Builders, Inc.
Lee Co., K. O.
Standard Electrical Tool Co., The
GRINDERS—Centerless & Center Type
Cincinnati Grinders, Inc.
GRINDERS—Chip Breaker
Delta Mfg. Co., The
Lee Co., K. O.
GRINDERS—Combination Twist Drill & Tap
Gallmeyer & Livingston Co.
GRINDERS—Cutter & Tool Attachments
Cincinnati Milling Machine Co.
GRINDERS—Crankshaft
Lempco Products, Inc.
GRINDERS—Cylindrical
Cincinnati Grinders, Inc.
J & S Tool Co.
Norton Co.
GRINDERS—Die
Standard Electrical Tool Co., The
GRINDERS—Disc
Besly & Co., Charles H.
Lempco Products, Inc.
Standard Electrical Tool Co., The
GRINDERS—Engraving Cutter
Preis Engraving Machine Co., H. P.
GRINDERS—External
Standard Electrical Tool Co., The
GRINDERS—Face
Oliver Instrument Co.
Standard Electrical Tool Co., The
GRINDERS—General Purpose
Hammond Machinery Builders, Inc.
Standard Electrical Tool Co., The
GRINDERS—Hand (See GRINDERS—Portable)
GRINDERS—Heavy Duty
Hammond Machinery Builders, Inc.
Standard Electrical Tool Co., The
GRINDERS—Hydraulic
Cincinnati Grinders, Inc.
Gallmeyer & Livingston Co.
GRINDERS—Internal
Abrasive Machine Tool Co.
Lempco Products, Inc.
Rivett Lathe & Grinder, Inc.
Sar-Way Industries
Standard Electrical Tool Co., The
GRINDERS—Plain, Center Type
Cincinnati Grinder, Inc.
GRINDERS—Portable
Chicago Wheel & Mfg. Co.
Dumore Co., The
Foredom Electric Co.
Precise Products Corp.
Standard Electrical Tool Co., The
GRINDERS—Potable Pneumatic
M-B Products
GRINDERS—Precision for Contours
Baker Bros., Inc.
Dumore Co., The
GRINDERS—Profile
Boyar-Schultz Corp.
GRINDERS—Ring Wheel
Besly & Co., Charles H.
Standard Electrical Tool Co., The
GRINDERS—Snagging
Standard Electrical Tool Co., The
GRINDERS—Stationary Pneumatic
M-B Products
GRINDERS—Surface
Abrasive Machine Tool Co.
Builders Iron Foundry
Delta Mfg. Co., The
Gallmeyer & Livingston Co.
Lempco Products, Inc.
Norton Co.
Reid Brothers Co., Inc.
Sanford Mfg. Co.
GRINDERS—Tap
Boggis & Co., Henry P.
Gallmeyer & Livingston Co.
Minn-Kota Foundry & Mfg. Co.
GRINDERS—Tool Bit
Oliver Instrument Co.
GRINDERS—Tool & Cutter
Boyar-Schultz Corp.
Cincinnati Milling Machine Co.
Cleveland Tool Engineering Co., The
Douglas Machinery Co., Inc.
Gorton Machine Co., George
Kearney & Trecker Products Corp.
Norton Co.
Oliver Instrument Co.
Production Machine Co.
Production Machinery Development Co.
Scherr Co., Inc., George
GRINDERS—Tool Post
Lempco Products, Inc.
Standard Electrical Tool Co., The
GRINDERS—Twist Drill
Gallmeyer & Livingston Co.
GRINDERS—Universal
Cincinnati Grinders, Inc.
Norton Co.
Production Machine Co.
Rivett Lathe & Grinder, Inc.
GRINDERS—Universal Tool & Cutter
Cincinnati Milling Machine Co.
Douglas Machinery Co., Inc.
Gallmeyer & Livingston Co.
Lee Co., K. O.
GRINDERS—Utility
M-B Products
GRINDERS—Vertical Spindle
Standard Electrical Tool Co., The
Stuart Industries, Inc.
GRINDERS—Wet Tool
Standard Electrical Tool Co., The
GRINDING & LAPPING—Precision
Acme Industrial Co.
J & S Tool Co.
GRINDING (Cylindrical) & POLISHING MACHINES
Hammond Machinery Builders, Inc.
GRINDING WHEELS
Carborundum Co., The
Chicago Wheel & Mfg. Co.
DeSanno & Sons, A. P.
Norton Co.
GUIDE PINS
Danly Machine Specialties, Inc.
Die Supply Co.
HAMMERS—Board Drop
Chambersburg Engineering Co.
HAMMERS—Rawhide
Chicago Rawhide Mfg. Co.
HAMMERS—Replaceable Face
Greene, Tweed & Co.
HAMMERS—Single & Double Frame Forgings
Chambersburg Engineering Co.
HAMMERS—Soft Alloy
Industrial Products Suppliers
HAMMERS—Steam Drop
Chambersburg Engineering Co.
HAMMERS—Steel Inspector
Cunningham Co., M. E.
HANDLES—Gage
Tanel Engineering Co.
HARD SURFACING
Scully-Jones & Co.
HARDNESS TESTERS
Ames Co., B. C.
Clark Instrument, Inc.
Shore Instrument & Mfg. Co., Inc., The
Wilson Mechanical Instrument Co. Inc.
HEADS—Boring (See BORING HEADS)
HEADS—Dividing
Cincinnati Milling Machine Co.
HEADS—Milling
Gorton Machine Co., George
HEAT TREATING
Perfection Tool & Metal Heat Treating Co.
HOBBERS—Gear (See GEAR HOBBERS)
HOBS—Hook Checking Machine For
Detroit Tap & Tool Co.
HOBS—Thread
Detroit Tap & Tool Co.
U. S. Machine Tool Mfg. Corp.
HOBS—Thread Milling
Pipe Machinery Co., The
U. S. Machine Tool Mfg. Corp.
HOLDERS—Adjustable
Ford Motor Co., Johansson Div.
HOLDERS—Broach (SEE BROACH HOLDERS)
HOLDERS—Drill
Armstrong Bros. Tool Co.
Rusnok Tool Works
HOLDERS—Steel for Number
Cunningham Co., M. E.
HOLDERS—Tap
Procunier Safety Chuck Co.
HOLDERS—Tool
Acme Tool Co.
Allison Tool & Engraving Co.
Armstrong Bros. Tool Co.
Boyar-Schultz Corp.
Dearborn, Inc., Howard
Gairing Tool Co., The
Wesson Products Co.
HOLDING FIXTURES
Zagar Tool, Inc.
HONING—Contract
Enterprise Machine Parts Corp., The
HONING MACHINES—Cylindrical
Automotive Maintenance Machinery Co. (Ammco)
HONING MACHINES—Horizontal
Enterprise Machine Parts Corp., The
Sunnen Products Co.
HOUSINGS—Aluminum Sheet
Conrad & Moser
HYDRAULIC MACHINERY
Peerless Machine Co.
Rockford Machine Tool Co.

IDENTIFICATION COLORS
Dykem Co., The
INDEX BASES
Allison Tool & Engineering Co.
INDEXING DEVICES
Hartford Special Machinery Co., The
INDEXING FIXTURES
Zagar Tool, Inc.
INDEXING HEADS—Universal
Cleveland Tool Engineering Co., The
INDICATORS
Lufkin Rule Co.
INDICATORS—Dial
Ames Co., B. C.
Federal Products Corp.
Scherr Co., Inc., George
INSPECTION DEVICES
Bartelt Engineering Co.
IRONS—Angle
Challenge Machinery Co., The

JACKS—Machine
Armstrong Bros. Tool Co.
Enterprise Machine Parts Corp.



MILWAUKEE
DIE FILER with
SAW OVERARM

For
ACCURATE
Internal Sawing

On the Milwaukee Die Filer, the saw overarm may be substituted for the file support roller arm in a few minutes. The accuracy of sawing operations which the saw attachment makes possible, leaves very little metal for subsequent filing . . . a vital factor in reducing costs and sawing time in tool and die shops.

Write for Illustrated Bulletin

$125.00 F. O. B. Milwaukee **COMPLETE with MOTOR and SAW ATTACHMENT**

$118.50 without Saw Overarm. For machines without motor, deduct $8.50 from these prices.

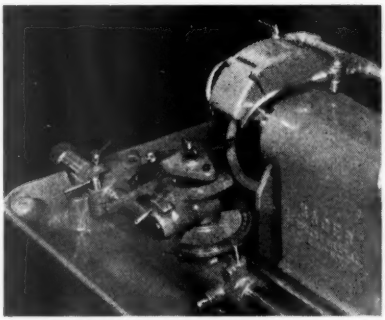
Manufactured by

Milwaukee
CHAPLET & MANUFACTURING CO.

1029 S. 40th ST., MILWAUKEE 4, WIS.

Hager Carbide Tool Grinder

A carbide tool grinder made by E. F. Hager & Son, Dept. T, 98-02 217th Lane, Queens Village 9, L. I., N. Y., speeds precision carbide tool grinding and eliminates need of highly skilled operators. Based on the fundamental principle of Swiss type grinders, Hager Carbide Tool Grinders grind or lap to high degree



precision, carbide cutting tools for lathes and screw machines besides tool bits with carbide tips inserted in milling cutters. All angles can be accurately rough and finish ground or lapped on the diamond wheels by simple mechanical settings in less time than rough grinding alone requires on hand tool grinders. Hager Carbide Tool Grinders eliminate guess work and free-hand operation. With the tool clamped in the easily adjustable vise-like tool holder and set by built-in protractors for the cutting edge and clearance angles, the uniform reciprocating action of the tool across the diamond wheel assures a keen edge and straight face on the tool every time. After the tool is locked in the desired position, the tool holder can be slid from the rough to the finish grinding wheel without removal from the machine or changing the angular settings. Parallel slides are easily obtained and duplicate tools can be ground and used interchangeably. Tests under a microscope reveal that the mechanically true edge, ground to a lapped finish through the reciprocating action of the Hager tool holder, requires far less regrinding than edges ground by any other method.

INFORM-A-GRAM KEY No. A64-B

JIG BORERS
DeVlieg Machine Co.
Gorton Machine Co., George
Kearney & Trecker Products Corp.
Lorain Machine & Tool Co., The
Moore Special Tool Co., Inc.
JIG GRINDERS
Moore Special Tool Co., Inc.
JIGS
Acro Tool & Die Works
Bunell Machine & Tool Co., The
Cleveland Universal Jig Co.
Dresel-Betz Co.
Electrix Corp.
Enterprise Machine Parts Corp., The
Federal Tool Corp.
General Die & Tool Co.
Lorain Machine & Tool Co., The
Master Gauge Co.
McKinney Tool & Mfg. Co., The
Merz Engineering Co.
Moore Special Tool Co., Inc.
National Machine Tool Co.
Paramount Tool Co.
Rockford Die & Tool Works, Inc.
Schraner & Co., A. P.
Siewek Tool Div. of Domestic Industries, Inc.
Star Machine & Tool Co.
Ulmer Co., The J. C.
Viking Tool & Machine Corp., The

KEY SETS
Holo-Krome Screw Corp., The
KEYS—Socket Screw
Die Supply Co.
Holo-Krome Screw Corp., The
KNEES—Toolmakers'
Acme Tool Co.
KNOBS—Hand
Siewek Tool Div. of Domestic Industries, Inc.
KNURLING TOOLS
Armstrong Bros. Tool Co.
Brand Tool & Supply Co.
KNURLS—Steel
Mercury Metal Die & Letter Co.

LAPPING COMPOUNDS
Acro Tool & Die Works
Carborundum Co., The
LAPPING—Contract
Acme Industrial Co.
LAPPING MACHINES
Cincinnati Grinders, Inc.
Norton Co.
Schraner & Co., A. P.
LAPPING PLATES (See PLATES—Lapping)
LAPS
Acro Tool & Die Works
Boyar-Schultz Corp.
Chicago Drillet Corp.
LATHE ACCESSORIES
General Die and Stamping Co.
South Bend Lathe Works
LATHE CENTERS
Kennametal, Inc.
LATHE CONVERTERS
Master Mfg. Co., The
LATHE DOGS
Armstrong Bros. Tool Co.
LATHE STOPS
American Products Co., The
LATHE TOOL CABINETS
Armstrong Bros. Tool Co.
LATHE TOOL POSTS
Armstrong Bros. Tool Co.
LATHE TOOLS
Armstrong Bros. Tool Co.
South Bend Lathe Works
LATHES—Back-Geared
Logan Engineering Co.
LATHES—Ball Bearing
Logan Engineering Co.
LATHES—Bench
Logan Engineering Co.
Rivett Lathe & Grinder, Inc.
South Bend Lathe Works
LATHES—Engine
South Bend Lathe Works
LATHES—Magnetic Polishing
Lima Electric Motor Co., The
LATHES—Manufacturing
Logan Engineering Co.
LATHES—Metal Works
Logan Engineering Co.
South Bend Lathe Works
LATHES—Precision
Hardinge Brothers, Inc.
Logan Engineering Co.
South Bend Lathe Works
Springfield Machine Tool Co., The
LATHES—Screw Cutting
Logan Engineering Co.
LATHES—Speed
Standard Electrical Tool Co., The
LATHES—Toolroom
Hardinge Brothers, Inc.
Logan Engineering Co.
Rivett Lathe & Grinder, Inc.
Sheldon Machine Co., Inc.
South Bend Lathe Works
LATHES—Turret
Logan Engineering Co.
South Bend Lathe Works
LAYOUT FLUID
Die Supply Co.
Dykem Co., The
Michigan Chrome & Chemical Co.
LEADER PINS
Die Supply Co.
LETTERS & FIGURES—Steel
Mercury Metal Die & Letter Co.
New Method Steel Stamps, Inc.
LIFTERS
Cullen-Friestedt Co.
Economy Engineering Co.
Lyon-Raymond Corp.
LIGHTING EQUIPMENT—Industrial
Gorton Machine Co., George
Vimco Mfg. Co.
LOCKS—Fixture
Siewek Tool Div. of Domestic Industries, Inc.
LUBRICANTS—Gage
Protective Coatings, Inc.
LUBRICATORS
M-B Products
Madison-Kipp Corp.

MACHINE PARTS
Enterprise Machine Parts Corp., The
MACHINERY—Precision
General Engineering & Mfg. Co.
MACHINERY—Special
Lorain Machine & Tool Co., The
Schraner & Co., A. P.
Triangle Engineering Co.
MACHINES—Die Filing
Illinois Tool Works
Milwaukee Chaplet & Mfg. Co.
Oliver Instrument Co.
MAGNIFIERS—Headband
Carl Zeiss, Inc.
MANDRELS
Lee Co., K. O.
MANDRELS—Expanding
Lee Co., K. O.
Young Arbor Co.
MARKING DEVICES
Cunningham Co., M. E.
Mercury Metal Die & Letter Co.
MARKING INKS—Metal
Dykem Co., The
MARKING MACHINES
Acromark Co., The
Gottscho, Inc., Adolph
Preis Engraving Machine Co., H. P.
MASTER TYPE—Marking
Preis Engraving Machine Co., H. P.
METAL—Strenes
Advance Foundry Co., The
MEASURING INSTRUMENTS—Precision
Ames Co., B. C.
MICROMETERS
Brand Tool & Supply Co.
Lufkin Rule Co.
Scherr Co., Inc., George
Tubular Micrometer Co.
MICROMETERS—Inside
Tubular Micrometer Co.
MILLING & JIG BORING MACHINES
Linley Bros. Co.
MILLING MACHINE ARBORS
Cincinnati Milling Machine Co.
MILLING MACHINES—Attachments
Burke Machine Tool Co.
Cincinnati Milling Machine Co.
Gorton Machine Co., George
Kearney & Trecker Products Corp.
Rusnok Tool Works
MILLING MACHINES—Automatic
Cincinnati Milling Machine Co.
MILLING MACHINES—Bench
Ames Co., B. C.
Burke Machine Tool Co.
MILLING MACHINES—Continuous
Sommer & Adams Co., The
MILLING MACHINES—Dial Type
Cincinnati Milling Machine Co.
MILLING MACHINES—Duplex
Cincinnati Milling Machine Co.
MILLING MACHINES—Horizontal
Cincinnati Milling Machine Co.
Douglas Machinery Co., Inc.
Kempsmith Machine Co., The
Lucas & Son, Inc., J. L.
MILLING MACHINES—Hydraulic
Cincinnati Milling Machine Co.
MILLING MACHINES—Motor Driven
Burke Machine Tool Co.
MILLING MACHINES—Multiple Spindle
Cincinnati Milling Machine Co.
MILLING MACHINES—Plain
Kearney & Trecker Products Corp.
MILLING MACHINES—Plain, Universal
Cincinnati Milling Machine Co.
Douglas Machinery Co., Inc.
Kearney & Trecker Products Corp.
MILLING MACHINES—Precision
Hardinge Brothers, Inc.
Kempsmith Machine Co., The
Nichols & Sons, W. H.
MILLING MACHINES—Production
Kearney & Trecker Products Corp.
Nichols & Sons, W. H.
MILLING MACHINES—Profile
Cincinnati Milling Machine Co.
MILLING MACHINES—Rail Type
Cincinnati Milling Machine Co.
MILLING MACHINES—Rotary Head
Kearney & Trecker Products Corp.
MILLING MACHINES—Vertical
Cincinnati Milling Machine Co.
Gorton Machine Co., George
Kearney & Trecker Products Corp.
Sommer & Adams Co., The
MILLS—Hollow
Gairing Tool Co., The
Genesee Mfg. Co., Inc.
MOLDING COMPOUNDS
Catalin Corp.
MOTORS—Electric
Lima Electric Motor Co., The

NAME PLATES—Plastic
Eastern Etching & Mfg. Co.
NIBBLING MACHINES—Metal
National Machine Tool Co.
NOTCHING EQUIPMENT
Wales-Strippit Corp.
NUMBERING MACHINES
Numberall Stamp & Tool Co.
NUT SETTER—Pneumatic
Aro Equipment Corp., The

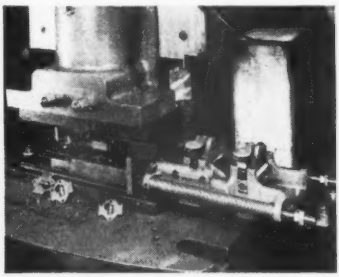
OIL LUBRICATION SYSTEMS—Automatic
Rivett Lathe & Grinder, Inc.
OILS—Quenching & Tempering
Park Chemical Co.
OPTICAL COMPARATORS
Fish-Schurman Corp.
Scherr Co., Inc., George
Trico Products Corp.
OPTICAL FLATS
Acme Industrial Co.
Scherr Co., Inc., George
OPTICAL MAGNIFIERS
Cargille, B. P.
OVENS—Industrial
Johnson Gas Appliance Co.

PANS—Tote
Lucas & Son, Inc., J. L.
PARALLELS—Box, Flat, Solid
Acme Tool Co.
PARALLELS—Magnetic
Scherr Co., Inc., George
PARALLELS—Solid
Challenge Machinery Co.
PARALLELS—Toolmakers
Acro Tool & Die Works
Ford Motor Co., Johansson Div.
PHOTOCOPY EQUIPMENT
American Photocopy Equipment Co.
PILOTS
Wesson Products Co.
PIPE TOOLS
Armstrong Bros. Tool Co.
PLASTIC EQUIPMENT
Say-Way Industries
PLASTIC MOLDING MACHINES—Injection
Lester-Phoenix, Inc.
PLATES—Angle
Acme Tool Co.
Smith Tool & Engineering Co.
Challenge Machinery Co., The

SAVE MONEY - SPEED WORK

with this

Dickerman Die Feed



★

Consider These Points

1. **Both die and feed can be set up as quickly as die alone.**
2. **Accurate, automatic.**
3. **Reduces labor time and stock waste.**
4. **Takes coiled stock up to $\frac{3}{16}$″ thick, 4″ wide.**
5. **Adjustable in increments of .001″ from 0″ to maximum feed length.**

Dickerman-built by craftsmen for craftsmen

AMAZINGLY LOW FIRST COST

Write today for descriptive folder

H. E. DICKERMAN MFG. CO.

312 TD Albany Street • Springfield, Mass.

Vertical Spindle Grinder

Abrasive Machine Tool Co., Dept. DJ, East Providence 14, R. I., has recently announced a new Vertical Spindle Surface Grinder, No. M34. The design of this machine is a departure from previous models. The purpose has been to produce a vertical spindle type grinder

which will provide more power at the cutting point, minimize vibration, and eliminate gearing and belting troubles.

The grinding wheel, provided as standard equipment, is the segment type, mounted in 6″ diameter segment wheel chuck. This type of wheel has proved very effective both in removing stock and in securing a high grade finish. Where the nature of the work requires a cup wheel, the segment wheel chuck may be readily removed and a type 2 steelback wheel applied.

Transmission case is a complete drive unit, readily detached from the machine. A built-in hydraulic shock absorber eliminates shock of the table reversal; two speeds are available.

Many types of flat grinding, such as small flat dies, washers, punches, spacers, chasers, parallels, raising blocks, etc., can be done fast and economically on this grinder. Rotary and wet grinding attachments, and magnetic chucks are available; also a new bulletin on the No. M34.

INFORM-A-GRAM KEY No. 754-B

PLATES—Angle Adjustable (Sine Bar)
Nichols-Morris Corp.
Robbins Engineering Co.
Triangle Engineering Co.
PLATES—Angle, Compound
Angle Computer Co.
PLATES—Bench
Challenge Machinery Co., The
Delta Mfg. Co., The
PLATES—Cold (See COLD PLATES)
PLATES—Index
Vinco Corp.
PLATES—Lapping
Acme Tool Co.
Challenge Machinery Co., The
Delta Mfg. Co., The
Smith Tool & Engineering Co.
PLATES—Surface, Glass (See SURFACE PLATES, Glass)
PLUGS—Hollow & Socket Pipe
Die Supply Co.
Holo-Krome Screw Corp., The
POINT THINNER
Oliver Instrument Co.
POINTS
Ford Motor Co., Johansson Div.
Norton Co.
POLISHERS & BUFFERS
Hammond Machinery Builders, Inc.
Production Machine Co.
Sommer & Adams Co., The
Standard Electrical Tool Co., The
POLISHING GRAINS & POWDERS
Carborundum Co.
Norton Co.
POLISHING WHEELS—Rubber
Chicago Wheel & Mfg. Co.
PRECISION PARTS—Aircraft
Pipe Machinery Co., The
PRECISION PARTS—Hardened & Ground
Acme Industrial Co.
PRESSES—Air
Mead Specialties Co.
PRESSES—Arbor
Lempco Products, Inc.
Wilson, K. R.
PRESSES—Bench, Punch
Benchmaster Mfg. Co.
PRESSES—Broaching
American Broach & Machine Co.
PRESSES—Drill
Baker Bros., Inc.
Delta Mfg. Co., The
Hamilton Tool Co., The
PRESSES—Flanging
Cincinnati Shaper Co., The
PRESSES—Hydraulic
Lempco Products, Inc.
PRESSES—Straightening
American Broach & Machine Co.
Denison Engineering Co., The
PRESSES—Utility or Shearing
Producto Machine Co., The
PRODUCTION JOB WORK
Rockford Die & Tool Works, Inc.
PRODUCTION MACHINE REPAIR PARTS
Enterprise Machine Parts Corp., The
PROFILERS
Acme Tool Co.
PROJECTORS
Scherr Co., Inc., George
PUMPS—Centrifugal
Ruthman Machinery Co., The
PUMPS—Circulating
Ruthman Machinery Co., The
PUMPS—Coolant
Ruthman Machinery Co., The
PUMPS—Lubricant
Ruthman Machinery Co., The
PUNCHES—Center & Drive Pin
Lufkin Rule Co.
PUNCHES—Interchangeable
Cincinnati Tool Co., The
PUNCHES—Hand, Toggle Action
Knu-Vise, Inc.
PUNCHES—Standard & Interchangeable
Hovis Screwlock Co.
Wales-Strippit Corp.
Whistler & Sons, Inc., S. B.
PUNCHING ATTACHMENTS
Dreis & Krump Mfg. Co.

REAMER DRIVES
Lee Co., K. O.
REAMERS
Black Drill Co.
Cleveland Twist Drill Co., The
Evans Reamer & Machine Co.
National Twist Drill & Tool Co.
Putnam Tool Co.
Super Tool Co.
Wesson Products Co.
REAMERS—Carbide
Super Tool Co.
REAMERS—Ground Flute
Lavallee & Ide, Inc.
REAMERS—Special
Detroit Reamer & Tool Co.
Lavallee & Ide, Inc.
Metal Cutting Tools & Mfg. Co.
REAMERS—Straight
Metal Cutting Tools & Mfg. Co.
REAMERS—Taper Pin
Lavallee & Ide, Inc.
RESINS—Cast
Catalin Corp.
RETAINERS—Punch & Die
Hovis Screwlock Co.
RIVETING MACHINES
Linley Brothers Co.
Tomkins-Johnson Co., The
ROLLER FEEDS—Automatic
Wittek Mfg. Co.
RUBBER ABRASIVES—Soft
Roberts Rubber Co., Weldon. (Brightboy Industrial Div.)
RULES—Steel
Lufkin Rule Co.

SALTS—Cyanide, Neutral & Hi Speed Steel
Park Chemical Co.
SANDERS
Walis Sales Corp.
SAWING MACHINERY
Tannewitz Works, The
SAWING MACHINES—Continuous
DoAll Company, The
SAWING MACHINES—Metal
Armstrong-Blum Mfg. Co.
Peerless Machine Co.
SAWS—Band
Barnes Co., Inc., W. O.
Kalamazoo Tank & Silo Co.
Tannewitz Works, The
SAWS—Diamond (See DIAMOND SAWS)
SAWS—Foundry
Tannewitz Works, The
Wells Mfg. Corp.
SAWS—General Purpose
Wells Mfg. Corp.
SAWS—Heavy Duty
Wells Mfg. Corp.
SAWS—Hole
Armstrong-Blum Mfg. Co.
SAWS—Hydraulic
Peerless Machine Co.
SAWS—Tool & Die Shop
Wells Mfg. Corp.
SCALES—Ellipse
Martin Design Studios
SCALES—Steel
Lufkin Rule Co.
SCREW DRIVERS—Pneumatic
Aro Equipment Corp., The
SCREW MACHINE PRODUCTS—Contract
Star Machine & Tool Co.
SCREW MACHINES—Hand
Logan Engineering Co.
SCREWS—Hexagon Head Cap
Strong, Carlisle & Hammond Co.
SCREWS—Hollow Set & Shoulder
Die Supply Co.
Strong, Carlisle & Hammond Co.
SCREWS—Socket Head
Chicago Screw Co., The
Danly Machine Specialties, Inc.
Detroit Die Set Corp.
Die Supply Co.
Standard Pressed Steel Co.
Strong, Carlisle & Hammond Co.
SCREWS—Socket Head Cap
Holo-Krome Screw Corp., The
SCREWS—Square Head Set
Strong, Carlisle & Hammond Co.
SCREWS—Transfer
Die Supply Co.
SCREWS—Turn
Inter-State Designing & Tool Co.
SCRIBERS
Ford Motor Co., Johansson Div.
Lufkin Rule Co.
SHAFT MACHINES—Flexible
Haskins Co., R. G.
SHAFTS—Worm
Ace Mfg. Corp

SHAPER TOOLS
Armstrong Bros. Tool Co.
SHAPERS
Ames Co., B. C.
Automotive Maintenance Machinery Co., (Ammco)
General Engineering & Mfg. Co.
SHARPENING STONES
Carborundum Co.
Norton Co.
SHEARS
Cincinnati Shaper Co., The
SHEARS—Bench
National Machine Tool Co.
O'Neil-Irwin Mfg. Co.
SHIMS—Stick
Industrial Products Suppliers
SINE BARS
Ford Motor Co., Johansson Div.
Vinco Corp.
SLOTTERS
Ames Co., B. C.
Douglas Machinery Co., Inc.
SLOTTERS—Universal
Douglas Machinery Co., Inc.
SPACERS—Arbor
Detroit Stamping Co.
Industrial Products Suppliers
SPANNERS
Armstrong Bros. Tool Co.
Sommer & Adams Co., The
SPECIAL MACHINERY
Builders Iron Foundry
Bunell Machine & Tool Co.
Enterprise Machine Parts Corp., The
Industrial Machine Co.
McKinney Tool & Mfg. Co., The
Merz Engineering Co.
Peerless Machine Co.
SPECIAL TOOLS
Rockford Die & Tool Works, Inc.
U. S. Machine Tool Mfg. Corp.
SPEED CONTROL VALVES
Tomkins-Johnson Co., The
SPINDLES
Sav-Way Industries
SPOTFACERS
Bokum Tool Co.
Continental Tool Works, Div. of Ex-Cell-O Corp.
Wesson Products Co.
SPOTTING PASTE
Dykem Co., The
SPRINGS
Gibson Co., The, William D. (Div. of Associated Spring Corp.)
Muehlhausen Spring Corp.
SPRINGS—Die
Danly Machine Specialties, Inc.
Detroit Die Set Corp.
Die Supply Co.
Muehlhausen Spring Corp.
SQUARES—Combination, Try & Miter
Lufkin Rule Co.
STACKERS
Economy Engineering Co.
STAMPINGS
Acro Tool & Die Works
Alofs Mfg. Co.
Detroit Stamping Co.
Federal Tool Corp.
General Die & Tool Co.
Gibson Co., The, William D. (Div. of Associated Spring Corp.)
Star Machine & Tool Co.
Variety Machine & Stamping Co.
STAMPINGS—Metal
Davis Tool & Engineering Co.
Dreael-Betz & Co.
STAMPINGS—Precision
Gibson Co., The, William D. (Div. of Associated Spring Corp.)
STAMPS—Steel
Cunningham Co., M. E.
Gottscho, Inc., Adolph
Hoggson & Pettis Mfg. Co., The
Mercury Metal Die & Letter Co.
New Method Steel Stamps, Inc.
Sossner Tap & Tool Co.
STEEL—Aircraft
Wheelock Lovejoy & Co., Inc.
STEEL—Alloy
Allegheny Ludlum Steel Corp.
Bissett Steel Co., The
Columbia Tool Steel Co.
Darwin & Milner, Inc.
Wheelock, Lovejoy & Co., Inc.
STEEL—Alloy, High Nickel
Carpenter Steel Co., The
STEEL—Carbon
Bissett Steel Co., The
Columbia Tool Steel Co.
Darwin & Milner, Inc.
Firth-Sterling Steel Co.

HERE is the Know-How book on the design, construction and use of plastics molds. This new second edition, already in its third printing, is a comprehensive gathering together in one accessible spot of the best experience of the industry's leading authorities.

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HUEBNER PUBLICATIONS

Book Department J8

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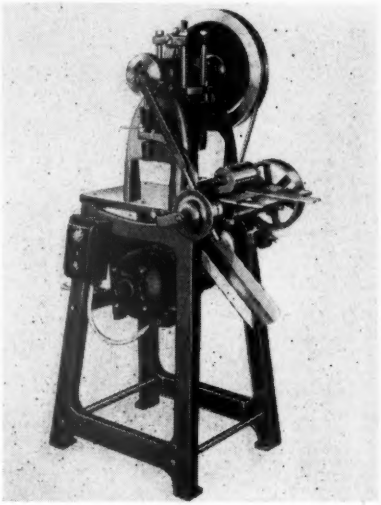
Cleveland 6, Ohio

Diebel Automatic Hi-Speed Press

The Diebel Hi-Speed Press was developed by Di Machine Corp., Dept. TD, 3654 Lincoln Ave., Chicago 13, Ill., for fast and economical production of small stampings. The feed is adjustable from 0 to 6"; width 0 to 4½". The press feed will positively and accurately operate at all speeds and can be engaged or disengaged without stopping the press. The



adjustment of clamping tension on feed rollers is not necessary. Diebel Hi-Speed Press maximum speed of 550 strokes pm with all parts smoothly synchronized permits the use of single dies for high production. It accommodates a die of maximum size 6¼" by 8". The maximum die space of 4⅛" closed, may be increased to 5¼" at added cost. The 4" ground cylinder ram provides maximum bearing surface of more than 50 sq in, and runs in an adjustable bearing sleeve to assure perfect die line up, resulting in a production increase of 10 to 30% and more blanks between grinds. Changeover from present dies for use in the Diebel press is easy for they are simply mounted on smaller sets or are used without change by using riser blocks.

INFORM-A-GRAM KEY No. 599-B

STEEL—Chromium
Darwin & Milner, Inc.
STEEL—Cobalt
Darwin & Milner, Inc.
STEEL—Cold Drawn
Bissett Steel Co., The
STEEL—Composite Die Sections
Allegheny Ludlum Steel Corp., Forging & Casting Div.
STEEL—Die (See STEEL—Tool & Die)
STEEL—Die Casting
Allegheny Ludlum Steel Corp.
Latrobe Electric Steel Co.
STEEL—Die Sections—Forged
Allegheny Ludlum Steel Corp., Forging & Casting Div.
STEEL—Drill
Crucible Steel Co. of America
STEEL—Electrical
Allegheny Ludlum Steel Corp.
STEEL—Graphitic
Timken Roller Bearing Co., The, Steel & Tube Div.
STEEL—Heat Resisting
Allegheny Ludlum Steel Corp.
STEEL—High Speed
Allegheny Ludlum Steel Corp.
Armstrong Bros. Tool Co.
Bokum Tool Co.
Cleveland Twist Drill Co.
Columbia Tool Steel Co.
Crucible Steel Co. of America
Darwin & Milner, Inc.
Firth-Sterling Steel Co.
Latrobe Electric Steel Co.
STEEL—Hobbing
Allegheny Ludlum Steel Corp.
Carpenter Steel Co., The
Firth-Sterling Steel Co.
STEEL—Mold
Allegheny Ludlum Steel Corp.
Carpenter Steel Co., The
STEEL—N.E. Analysis
Bissett Steel Co., The
STEEL—Punch, Chisel & Shock Resisting
Allegheny Ludlum Steel Corp.
Latrobe Electric Steel Co.
STEEL—Special Purpose
Allegheny Ludlum Steel Corp.
Crucible Steel Co. of America
STEEL—Stainless
Allegheny Ludlum Steel Corp.
Carpenter Steel Co., The
Crucible Steel Co. of America
Firth-Sterling Steel Co.
Latrobe Electric Steel Co.
STEEL—Strip, Hot & Cold Rolled
Allegheny Ludlum Steel Corp.
STEEL—Tool & Die
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Armstrong Bros. Tool Co.
Carpenter Steel Co., The
Cleveland Twist Drill Co., The
Crucible Steel Co. of America
Columbia Tool Steel Co.
Darwin & Milner, Inc.
Firth-Sterling Steel Co.
Latrobe Electric Steel Co.
Wheeler, Lovejoy & Co., Inc.
STEEL PLATE—Fabricator
Detroit Die Set Corp.
STEEL PLATE—Ground
Die Supply Co.
STEEL PLATE—Rough or Machined Torch Cut Shapes
Danly Machine Specialties, Inc.
Detroit Die Set Corp.
Die Supply Co.
STENCILS—Metal
Gottscho, Inc., Adolph
SURFACE PLATES (See PLATES, Surface)
SURFACE PLATES—Granite
Herman Stone Co., The
SURFACERS—Disc and Belt
Production Machine Co.
SURFACING MACHINES—Belt Type
Production Machine Co.
SUTTONIZING
Welding Equipment & Supply Co.

TABLES—Circular
Gorton Machine Co., George
TABLES—Elevating, Portable
Lyon-Raymond Corp.
Hamilton Tool Co., The
TABLES—Index
Gorton Machine Co., George
TABLES—Rotary
Acme Tool Co.
Gorton Machine Co., George
TABLES—Turn
Challenge Machinery Co., The
TAP EXTRACTORS
Clinton Machine Co.
TAP GRINDERS
Boggis & Co., Henry P.
TAP RECONDITIONING MACHINES
Detroit Tap & Tool Co.
TAPES—Measuring
Lufkin Rule Co.
TAPPERS—Hand
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Die Supply Co.
TAPPERS—Precision
Brand Tool & Supply Co.
Lassy Tool Co.
TAPPING HEADS
Procunier Safety Chuck Co.
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Hy-Pro Tool Co.
Sossner Tap & Tool Co.
TELESCOPERS
Economy Engineering Co.
TEMPLATES
Gage Co. Division
THREADING TOOLS
Armstrong Bros. Tool Co.
U. S. Machine Tool Mfg. Corp.
TOOL BITS
Acme Tool Co.
Allegheny Ludlum Steel Corp.
Black Drill Co., Div. Black Industries
Boyar-Schultz Corp.
Carboloy Co., Inc.
Darwin & Milner, Inc.
Die Supply Co.
Super Tool Co.
Wesson Products Co.
TOOL SHANKS
Allegheny Ludlum Steel Corp.
Cooper-Bessemer Corp., The
TOOL STANDS
Scherr Co., Inc., George
TOOL STEEL (See STEEL—Tool & Die)
TOOLS
Acro Tool & Die Works
Alofs Mfg. Co.
Barth Stamping & Machine Works
Bunell Machine & Tool Co., The
Enterprise Machine Parts Corp., The
Kiffer Tool & Die Co.
McKinney Tool & Mfg. Co., The
National Machine Tool Co.
U. S. Machine Tool Mfg. Corp.
TOOLS—Carbide Tipped
Allegheny Ludlum Steel Corp.
Continental Tool Works, Div. of Ex-Cell-O Corp.
Firth-Sterling Steel Co.
Kennametal, Inc.
Super Tool Co.
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TOOLS—Diamond (See DIAMOND TOOLS)
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Foredom Electric Co.
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TOOLS—Portable Electric
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Acme Tool Co.
TOOLS—Sintered Carbide
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Firth-Sterling Steel Co.
TOOLS—Special (See SPECIAL TOOLS)
TOOLS—Special Cutting (See CUTTING TOOLS—Special)
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Lyon-Raymond Corp.
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Bissett Steel Co., The
TUBING—Welded Stainless
Carpenter Steel Co., The
TURNING TOOLS
Wheel Trueing Tool Co.
TYPE—Rubber
Gottscho, Inc., Adolph
TYPE—Steel
Gottscho, Inc., Adolph
New Method Steel Stamps, Inc.
TYPE HOLDER
Mercury Metal Die & Letter Co.
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Lassy Tool Co.
Lufkin Rule Co.
Scherr Co., Inc., George
VALVES—Air
Mead Specialties Co.
VISE JAW CAPS
Yost Mfg. Co.
VISES
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Ideal Tool & Die Co., Inc.
Producto Machine Co., The
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Thomas Holst Co.
Yost Mfg. Co.
VISES—Machine
Cincinnati Milling Machine Co.
Gorton Machine Co., George
Producto Machine Co., The
VISES—Pipe
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Acme Tool Co.
Gorton Machine Co., George
Hartford Special Machinery Co., The
VISES—Precision
Vinco Corp.
VISES—Universal
Wesson Products Co.
VISES—Woodworkers' & Patternmakers'
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Die Supply Co.
WELDERS—Arc
Lee Co., K. O.
WELDING
Danly Machine Specialties, Inc.
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Lyon-Raymond Corp.
WELDING RODS
Darwin & Milner, Inc.
WHEEL DRESSING TOOLS (See TOOLS—Wheel Dressing)
WHEELS—Abrasive
Besly & Co., Charles H.
WHEELS—Cutting Off
Carborundum Co.
WHEELS—Diamond (See DIAMOND WHEELS)
WHEELS—Mounted
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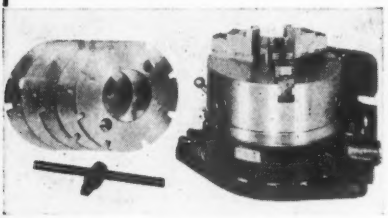

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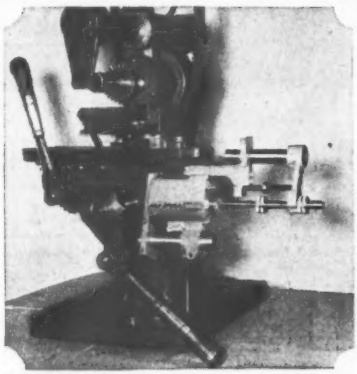

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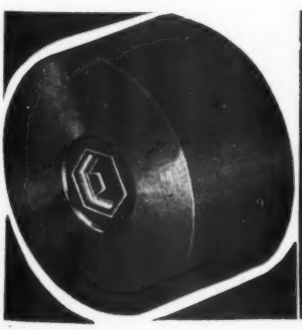

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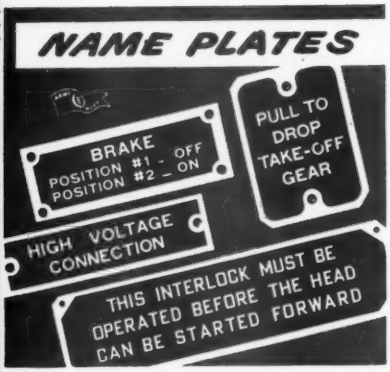
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THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD

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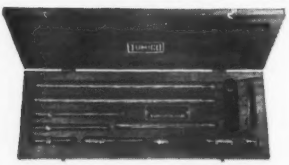

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TUBULAR MICROMETER CO.
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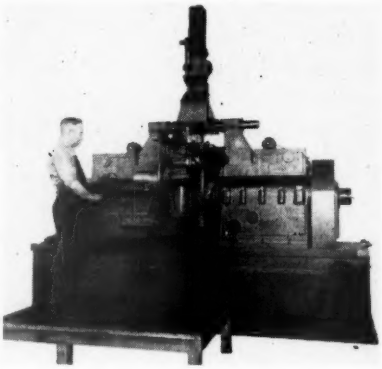
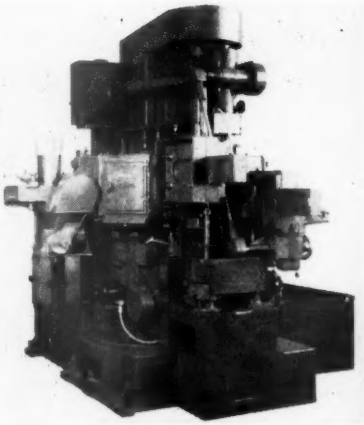
Parallel Surface Grinding

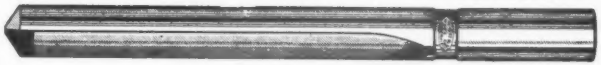
Small parts which require accurate grinding of parallel surfaces; parts such as washers, oil seals, sides of bearing races, piston rings, etc., can now be ground at new high speeds by Besly Grinders No. 253 and No. 926, which are produced by Chas. H. Besly and





Co., Dept. J, 118 N. Clinton St., Chicago, Ill. A typical example is the production of these grinders for grinding piston rings, work on which the two grinders are operated as a battery. On such work, the No. 253, a double horizontal spindle grinder with an improved automatic feed, does the rough and semi-finished grinding at the rate of 12,000 pieces per

GORAL CARBIDE TIPPED DRILLS



You can drill, counterbore or countersink in hardened steel with Goral Carbide Tipped Drills as easily as in mild steel with ordinary drills. On automatic machines, run at normal drilling speeds, costly down time is greatly reduced. But extremely high speeds are possible when desired.

Recommended for drilling hardened steel, cast iron, aluminum, bronze, brass, copper, plastics; also Goral Carbide Tipped Mason Drills for cement.

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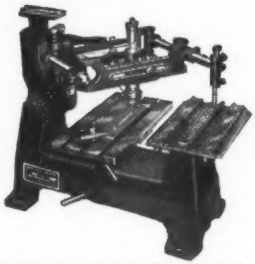

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Interchangeable heads for engraving, electrical marking, and acid etching . . . available for all models. Also Panto engraving cutters, cutter grinders, master copy type, endless belts, and accessories.

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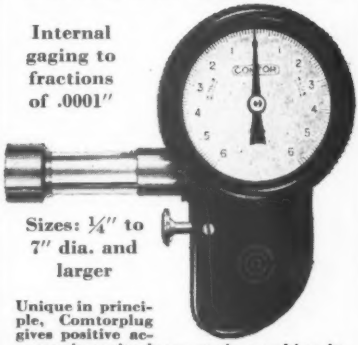
Internal gaging to fractions of .0001"



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Saves • TOOLS
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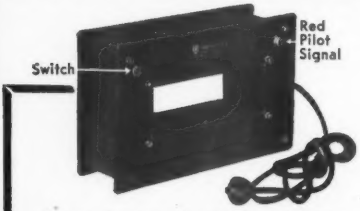

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hour. The No. 926, a double vertical spindle grinder, is used for finishing rings to .0002 tolerance at a rate of 8,500 pieces per hour. Since both of these machines are wet grinders, warpage as a result of grinding has been practically eliminated. Thus in spite of the substantial increase in hourly production, rejects are materially reduced. The No. 253 is a 42" Horizontal Double Spindle grinder. It is a heavy, rugged machine designed to rough grind and semi-finish grind parts having an approximate equal area on parallel surfaces. A wide range of work can be ground on this machine when it is equipped with various types of fixtures. Among the fixtures are a semi-automatic roll feed, semi-automatic rotary fixtures with multiple station solid or segmental feed wheels, a power oscillating fixture, and a hydraulic reciprocating planer type table mounted on the base between the grinding wheels, to which can be attached work holding fixtures. The machine comes equipped with a vertical bar type wheel dresser, power driven with automatic reversing switches, push button control and a dresser bar to accommodate diamonds or star cutters. The No. 926 is a 30" Double Vertical Spindle grinder, a precision tool designed to finish grind parts having an approximate equal area on parallel surfaces, such as piston rings, thrust washers, rotary pump vanes, precision instrument parts and other similar work pieces. Such work can be finish ground to a high degree for dimension, parallelism, uniformity and surface finish. No. 926 is not intended to remove a large amount of stock but rather small amounts at high feeding speeds. The abrasive wheels are of unusually fine grain, 120 to 320 grit. Wheel dressers furnished with the machine are power driven, push button controlled in main panel, with adjustable diamond holders. Work feeding mechanism is of the semi-automatic magazine type, equipped with quick change endless feed chains. Multiple station rotary feed wheels mounted on the verticle fixture spindle can also be furnished. These grinders are the end product of more than 35 years of precision grinding experience and incorporate design features proved by experience to deliver production with a minimum of wear or maintenance.

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With HOLDING Fixture for Bench Grinder

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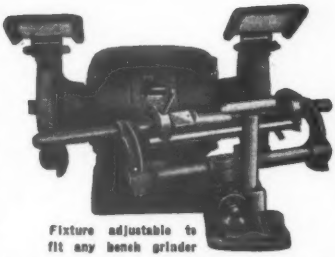

Fixture adjustable to fit any bench grinder

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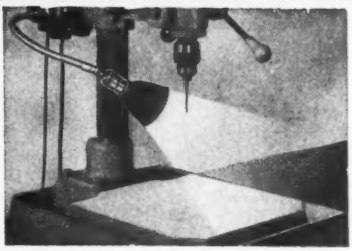

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For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

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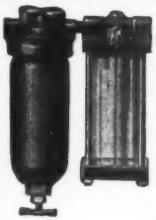
Removes 96% to 97% of All Water, Dirt and Scale from Airline.



AIR passes through a series of brass discs with .002 spacings, providing the finest degree of filtration obtainable. Then as the air passes through head of Lubricator, oil is delivered into the purified airline in any desired volume. The scarcity of replacement parts makes the use of these devices doubly important.

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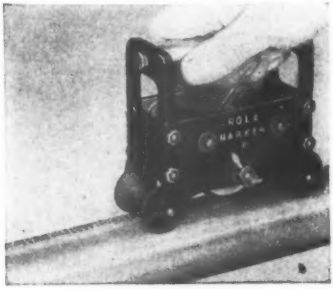

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Accurate Small Holes from .004 to 5/16" dia.

Built with "instrument precision" for finest work in tool rooms, Diesel, electrical, aircraft plants and laboratories.

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LUFKIN FOR ACCURACY
THE LUFKIN RULE CO., SAGINAW, MICH., NEW YORK CITY

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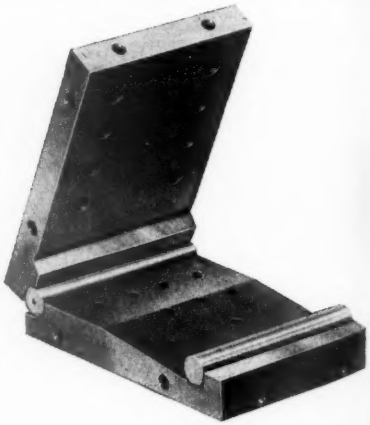
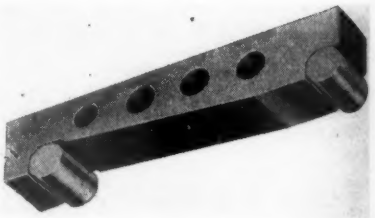
Designed for measuring angles accurately, or for locating work within a given angle to very close tolerance limits, Brand Sine Plates and Sine Bars are made by the Brand Tool and Supply Co.,





Dept. D, 500 W. Washington Blvd., Los Angeles 15, Calif. The 5" Sine Plates are four inches wide, and the Sine Bars are one inch wide. The measuring studs are of identical diameters, located 5.0000" plus or minus .0002" from center to center. Work may be clamped on the Sine Plates since holes are tapped on all working surfaces. Brand Sine Plates and Sine Bars are high grade alloy steel, properly heat treated and hardened, finish ground to a high degree of accuracy and may also be furnished in a ten-inch size.

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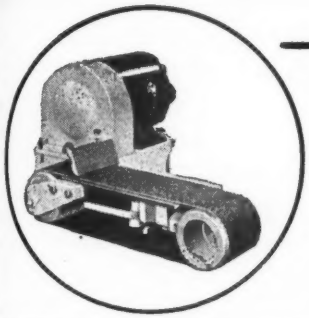

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STANDARD D-4 ABRASIVE BAND GRINDER

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

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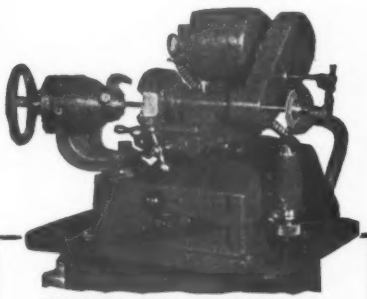

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- *Fast—easy to operate.*
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HEADS ONLY AVAILABLE FOR USE ON UNIVERSAL TOOL & CUTTER GRINDERS

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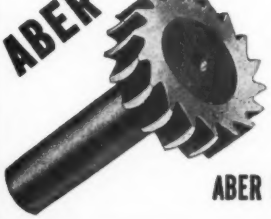

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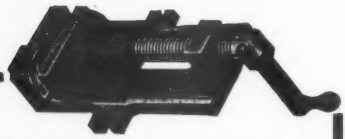

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
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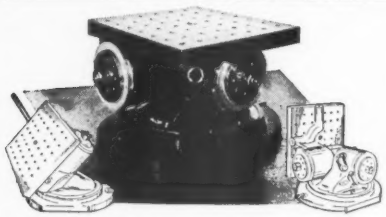

Universal Compound Angle Plate

Saves about 50% of time formerly consumed in set-up of work. Can be used on milling machine, shaper, jig borer, drill press, etc., to lay out, machine, and check work without removing work from plate. Can also be used as a 90° angle plate on the machine or on the surface plate. Holds work in any position from 0° to 90° in two planes, 90° apart, and in any position within 360° of the radial axis. The surface plate, from a position parallel to the base, may be tilted 90° in two directions and also rotated 360° on the base. Each of three protractors (two 5" and one 10" diameter) are calibrated to 1 minute and accurate within 10 seconds of the arc. Write for Bulletin No. 4. Angle Computer Co., (Dept. TD-8), 1709 Standard Avenue, Glendale 1, Calif.

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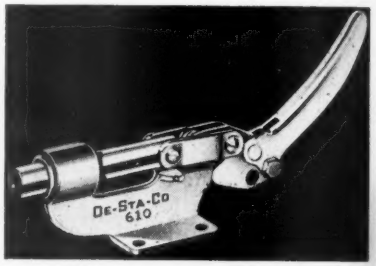
ANGLE COMPUTER

De-Sta-Co No. 610 Toggle Clamp

The De-Sta-Co Model 610 toggle clamp, produced by Detroit Stamping Company, Dept. TD, 344 Midland Ave., Detroit 3, Mich., will fill industry's need of a versatile toggle clamp for holding work securely in jigs or fixtures during various assembly and production operations. In step with this trend, a "Push-and-Pull Lock" clamp was introduced several months ago to serve in such operations as locating and indexing, and



is now supplemented by a larger model for heavier work. The De-Sta-Co Model 610 Toggle Clamp can be quickly converted from "Push" to "Pull" action, or vice versa, in a few seconds by simply relocating one of the handle bolts. Weighing only 1½ lbs, with an overall length of 6¾" ("Push" position) this heavy duty clamp has a plunger rod travel of 1½". The rod is tapped to receive a ⅜"—16 standard threaded bolt, providing for quick adjustment of the work being handled. The finish is silver-toned, rust-resistant plating. A new catalog complete with details of this new No. 610 toggle clamp, as well as of clamps for various other operations, is available from the manufacturer.

INFORM-A-GRAM KEY No. 165-B

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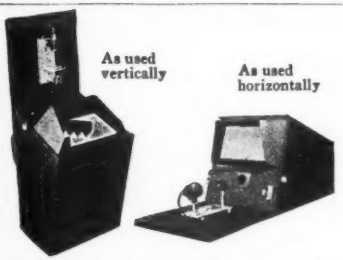

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Checks small parts quickly, accurately

For fast, detailed visual inspection of small intricate shapes such as gauges, dies, gears, parts of instruments, etc., checking height, width, thickness, radius, etc.

Used in either horizontal or vertical position. The Comparator's powerful aspheric condenser system and special lens produce an instantaneous accurate screen projection with a definite magnification of 13x, 25x and 50x. Other magnifications on special order. Convenient; compact.

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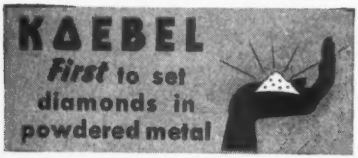
follow with proper use — not abuse.

KOEBEL Diamond Tools and Koebel literature on diamond care are designed to provide maximum value from your tools. Write for details.



KOEBEL DIAMOND TOOL CO.
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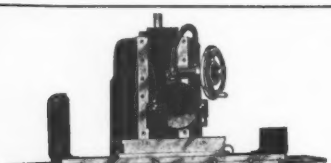

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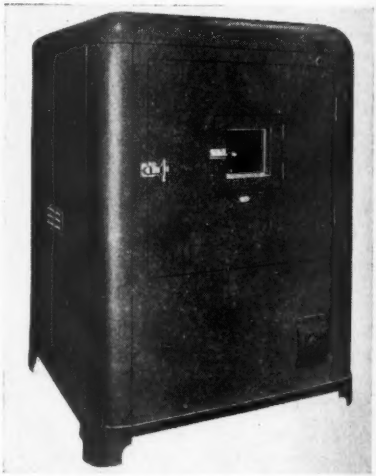

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2¼" x 5/16 flat iron cold

Hand Operated - - - Weight 40 lbs.

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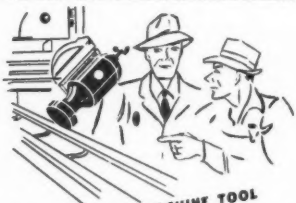

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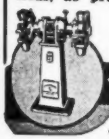

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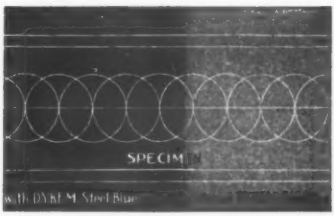

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6" 10" 12" 24" Range
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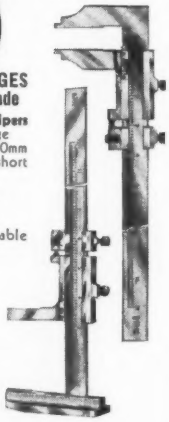

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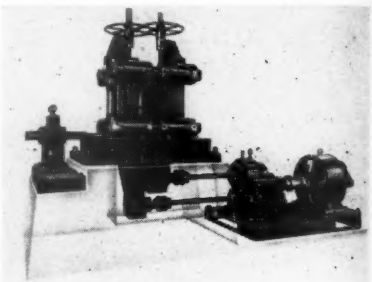

shapes and flats. The mill stand consists of a pair of vertical rolls, located immediately after the finishing stand of the tandem mill train. The roll stand can be moved horizontally to line up the pass line with any pass in the horizontal rolls of the finishing stand. The rolls can be adjusted vertically, so that any pass of the vertical rolls can be lined up with any pass of the horizontal rolls in the tandem mill. Roll housings of the precision mill are also adjustable with respect to each roll to control the size of the product. The mill is driven by a 100 hp, dc mill type variable speed motor. Rolls are positively driven by a special pinion stand through individual mill spindles and bevel gear drives. The pinion stand ends of the mill spindles are provided with splines which slide in the hollow pinions, to allow horizontal movement of the roll housings. The mill ends of these spindles are connected to the bevel gear drives by means of flexible couplings, which are provided with quick uncoupling flanges. The bottom end of the roll spindle fastens to the roll wabbler by means of a suitable coupling box. The wabbler end on the roll provides for any slight misalignment.

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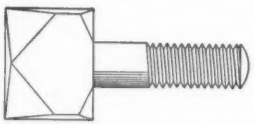

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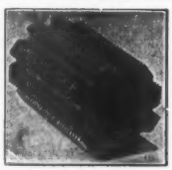

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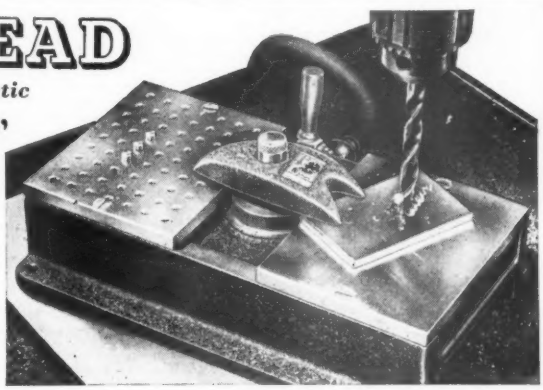

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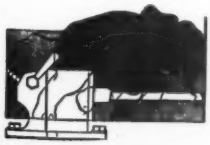

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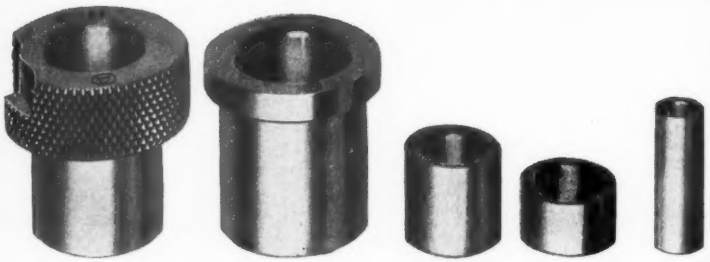

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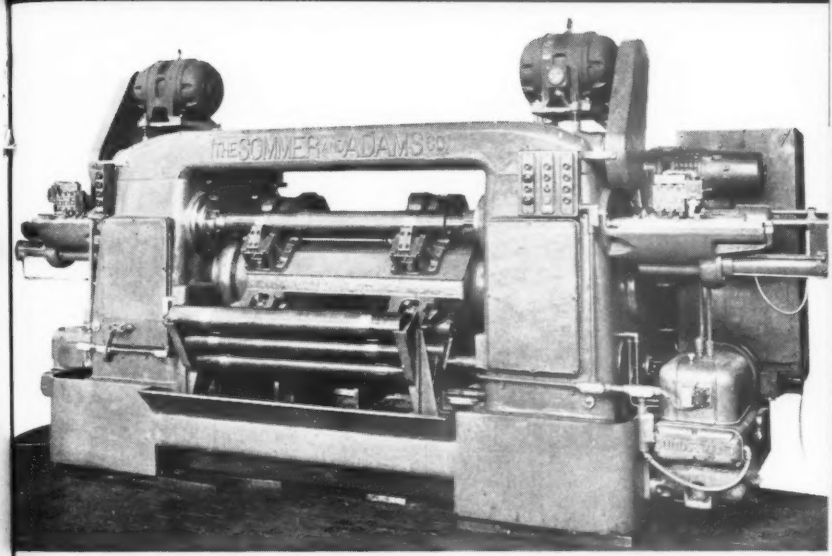

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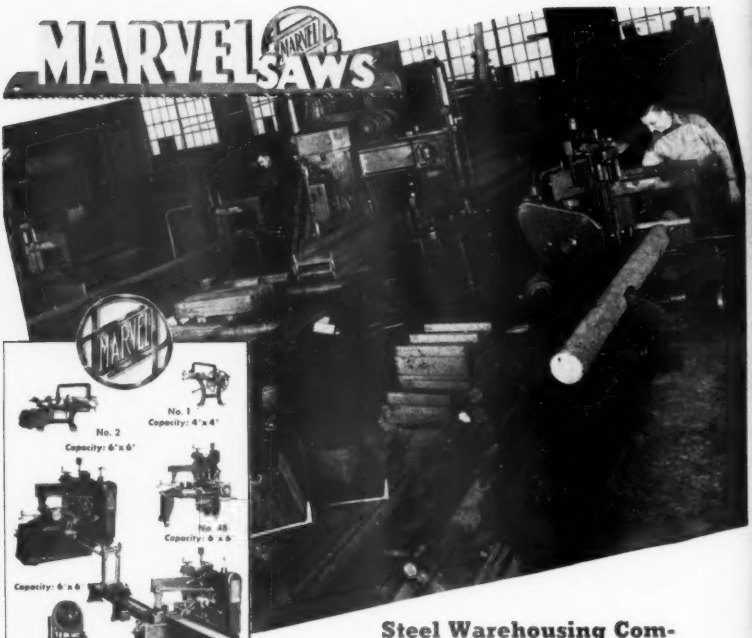

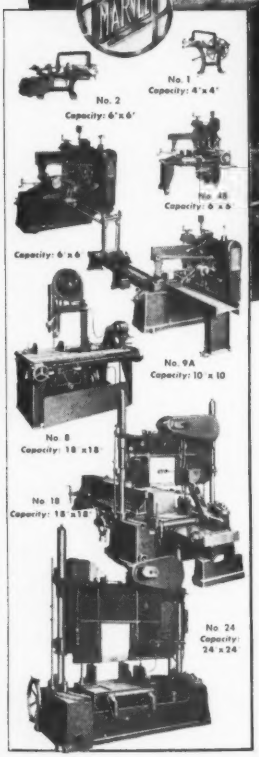

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